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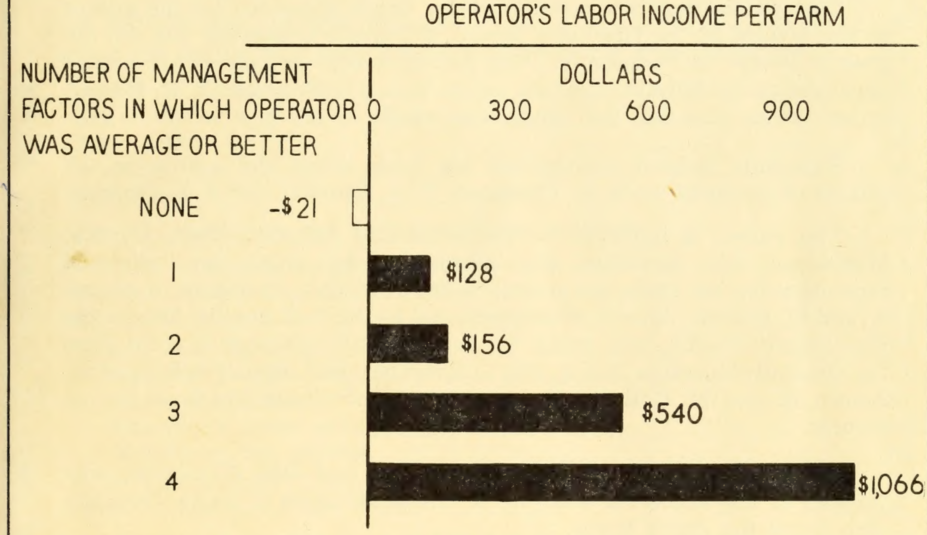
An Economic Study of
NEGRO OWNER-OPERATED FARMS
In Jefferson Davis County, Mississippi



GOOD FINANCIAL SUCCESS IN FARMING AMONG NEGRO OWNER-OPERATORS IN JEFFERSON DAVIS COUNTY IN 1950 REQUIRED ACCOMPLISHMENTS IN AT LEAST THREE IMPORTANT MANAGEMENT FACTORS

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An Economic Study of Negro Owner-Operated Farms In Jefferson Davis County, Mississippi

By

VOYCE J. MACK*

PURPOSE AND METHODS OF STUDY

This study was undertaken with several objectives: to find what factors contributed toward profitable farming in Jefferson Davis County in 1950; to see which of these factors were most important; to study the relationships among the factors that affect labor income; and to determine trends in the organization of the farms and farm enterprises over a period of years.

During the summer of 1951, records of the farm business organization were obtained by personal farm-to-farm visits to 155 Negro owner-operated farms (135 farms operated by non-Veterans and 20 farms operated by Veterans) in Jefferson Davis County, Mississippi. The period studied was the year January 1, 1950 to December 31, 1950.

A county highway map was used to locate communities. The teacher of agriculture and/or principal of each school within the area supplied the name and location of each farmer who owned and operated a farm within that district. An attempt was made to get a record from each farmer listed. During the course of the survey, the records were checked, first in the field and again in the office.

The tabular method was used in analyzing and arranging the data.

Jefferson Davis County, along with all or parts of fourteen other counties, is located in what is known as the Longleaf Pine Area of Mississippi. In general this region is similar in type of farming. It is believed that the results of this study will apply to a significant part of the agriculture of the Upland area of Mississippi. The facts revealed by this study will be useful to teachers of agriculture, agricultural extension workers, to workers in other agricultural agencies and to farmers.

DESCRIPTION OF JEFFERSON DAVIS COUNTY

Location

Jefferson Davis County is located in the southern part of Mississippi, about 40 miles south of Jackson, the capital and largest city in the State, and 85 miles north of the Gulf of Mexico. It is bounded on the north by Simpson County, on the east by Covington County, on the south by Marion County, and on the west by Lawrence County. The county has an area of 414 square miles, equal to 264,960 acres. Figure 1 shows the location of the county.

History

The first settlement in the region now included in Jefferson Davis County was made more than 140 years ago. The original Government land survey was made in 1811 and 1812, and a gradual settlement began about that time.[1]

The county was organized in 1906, from parts of Lawrence and Covington Counties. The immigrants came largely from the states lying to the east and northeast.

Originally the uplands of Jefferson Davis County supported an open forest of longleaf pine, while the bottoms had a thick forest of sweet gum, beech, shortleaf pine, magnolia, bay and water oak.[2]

---

*Research Assistant, Alcorn A. and M. College, at time study started.

[1] T. M. Bushnell and L. Vincent Davis, "Soil Survey of Jefferson Davis County, Mississippi," **Seventeenth Report of the U. S. Department of Agriculture, Field Operations of the Bureau of Soils,** (Washington, D. C., 1915), p. 1028.

[2] T. M. Bushnell and L. Vincent Davis, "Soil Survey of Jefferson Davis County, Mississippi," **Seventeenth Report of the U. S. Department of Agriculture, Field Operations of the Bureau of Soils,** (Washington, D. C., 1915), pp. 1029-1030.

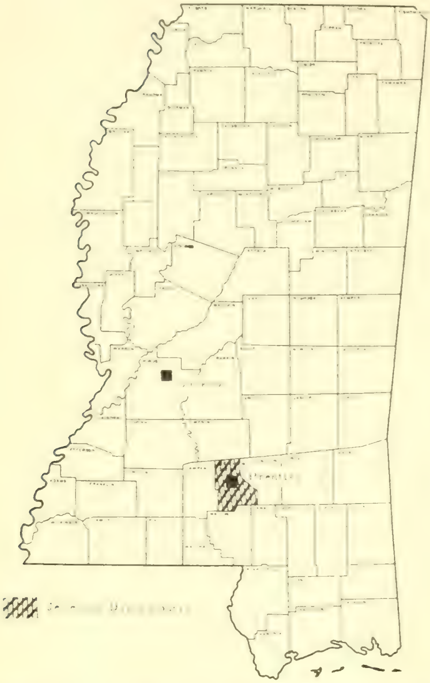

Figure 1. Location of Jefferson Davis County Area, Mississippi.

Cotton was "King" in Jefferson Davis County before the Civil War, with corn and forage crops next. Although it has declined in both acreage and in yield as a result of the coming of the weevil, cotton still is the most important farm crop.

Population

Table 1 summarizes the data for the total population of Jefferson Davis County for the census periods 1930, 1940 and 1950. In 1950 there were 15,500 inhabitants in the county which represented an increase of 1,219 or 9 percent since 1930.

Topography

The topography of Jefferson Davis County is gently rolling to hilly. The county is in the watershed between the Pearl and Pascagoula Rivers. The crest of this divide extends through the county from near the middle of the northern county line, where the elevation is more than 500 feet above sea level, southward through Carson and Bassfield townships and crosses the southern boundary county line, where the elevation is slightly more than 400 feet. The Pearl River bottom land in the southwestern corner and that of Bowie Creek in the southeastern part of the county are less than 200 feet above the sea level. The low levels reach far up toward the heads of the streams, while high ridges extend far down between the different lines of drainage. The grade of most of the hill slopes is gentle to moderate, although in a few places where the gullies lead down form the ridge tops it is quite steep. The mean elevation is about 450 feet. Because of the rolling nature of the land, much water is lost in runoff while the lack of decayed vegetation impairs the moisture-retaining properties of the soil.

Soils

All of Mississippi, as well as Jefferson Davis County, is in the tropical and sub-tropical Red and Yellow Soil group. The upland soils, which comprise about 84 percent of the area of the county, are derived chiefly from sedimentary materials of Coastal Plain formations, that is, from beds of sand, sandy clays, and heavy clays with beds of gravel. The soils of the stream bottoms consist of alluvium, or recently deposited material.

In the county 16 soil types are found. Nine phases of the types have been mapped and include principally three soil series—Ruston, Caddo, and Orange-

Table 1. Population of Jefferson Davis County, Mississippi, by census periods, 1930-1950.

Item	1930	1940	1950
Total	14,281	15,869	15,500
Urban	——	——	——
Rural	14,281	15,869	15,500
Rural farm	13,122	14,150	12,457
White	6,380	7,087	6,890
Non-white	7,901	8,782	8,610
Percent rural	100	100	100
Percent non-white	55.3	55.3	55.5
Percent rural farm	91.9	89.2	80.4
Acres per capita of farm population	13.4	13.6	14.0
Mississippi			
Acres in farms per capita of farm population	12.7	13.7	13.2

Table 2. Area of different soils, Jefferson Davis County, Mississippi.*

Soil	Acres	Percent of total
Ruston fine sandy loam	136,000	52.3
Caddo fine sandy loam	24,064	9.3
Orangeburg fine sandy loam	23,296	9.0
Bibb silt loam	12,608	4.9
Pheba silt loam	9,984	3.8
Ruston sandy loam	9,600	3.7
Ruston silt loam	6,720	2.6
Kalmia fine sandy loam	6,592	2.5
Ochlockonee silt loam	6,400	2.5
Susquehanna fine sandy loam	5,376	2.1
Kalmia silt loam	5,376	2.1
Cahaba fine sandy loam	3,840	1.5
Ochlockonee fine sandy loam	3,712	1.4
Susquehanna silt loam	3,584	1.3
Bibb fine sandy loam	2,688	1.0
Total	259,840	100.0

*T. M. Bushnell and L. Vincent Davis, "Soil Survey of Jefferson Davis County, Mississippi," **Seventeenth Report of the U. S. Department of Agriculture, Field Operations of the Bureau of Soils,** (Washington, D. C., 1915), p. 1037.

burg.[3] In addition there are small areas of Bibb, Pheba, Kalmia, Ochlockonee, Susquehanna and Cahaba. Table 2 gives the area of each soil type mapped. For the location of each series consult the agricultural workers of the county.

The Orangeburg series there is chiefly fine sandy loam. This upland type includes some of the best land in the county. It occurs, as a rule, on hillsides and on the slopes of stream valleys located near Prentiss and in the northern part of the county. The drainage is good but the soil washes seriously.

The Ruston fine sandy loam, Ruston sandy loam, and Ruston silt loam comprise the Ruston series area of the county, located mainly near the central section with numerous other areas scattered over the county. The Ruston fine sandy loam is the predominant soil of the county. The topography of that type is gently rolling to rolling. with the steeper slopes better adapted to pastures and forestry than for cultivated crops. The drainage is good. It is an important agricultural soil. The Ruston sandy loam and silt loam occur in relatively small areas.

The Pheba silt loam is less productive and less valuable than the Ruston soils. It has a characteristic yellow subsoil, with an indurated or heavy clay substratum. The Pheba silt loam occurs on the flattish tops of divides, found almost entirely in the southern part of the county. The topography ranges from nearly level to gently undulating. Although the topography is well suited to tillage and the type occurs mainly in fairly large areas, it is not important in the agricultural economy of the county, because of its low natural productiveness.

The Caddo fine sandy loam is grayish in color with a pale-yellow subsoil. It is poorly drained and not improved. The type is located mainly in the southern half of the county, though some areas of the type are associated with the Ruston soils in the northern part. The drainage ranges from fair to poor, as the type occupies comparatively low, gentle slopes or is flat.

The Susquehanna soils, the fine sandy loam and silt loam have red, heavy, plastic clay subsoils mottled with grey. They are of less value than the Pheba silt loam. This soil occurs in the southern half of the county on lower slopes of the drainage basins and other streams. The topography usually is gently to steeply sloping. The surface drainage is fair, and in places good, but the underdrainage is not well developed.

The Cahaba fine sandy loam occurs on level, well-drained second bottoms. It resembles Ruston fine sandy loam, but has a higher agricultural value. It is sometimes locally called "hammock land." The drainage is well established. Owing to its level topography and its warm, productive, well-aerated soil, this type is classed with the best land in the county for general farming.

The Kalmia fine sandy loam and silt loam are second bottom soils, which are less well drained, somewhat less productive, and less valuable than the Cahaba soil. The type is comparatively level, and the natural drainage is not well established.

The Ochlockonee fine sandy loam and silt loam are brown. They occupy overflowed bottom lands, and are highly productive, but are poorly suited to cotton under boll weevil conditions. Its surface is level, but more or less dissected by old stream channels. The drainage is fair, but the soil is covered after heavy rains. Under favorable moisture conditions this soil produces good yields.

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[3] T. M. Bushnell, and L. Vincent Davis, "Soil Survey of Jefferson Davis County, Mississippi," **Seventeenth Report of the U. S. Department of Agriculture, Field Operations of the Bureau of Soils,** (Washington, D. C., 1915), p. 1027.

The Bibb fine sandy loam and silt loam are mostly gray, with mottled soils and subsoils. They occur in poorly drained overflowed bottoms. These soils are best used for pasture. They have a low agricultural value.

Climate

Jefferson Davis County has a temperate, humid climate characterized by long, hot summers and usually by comparatively short, mild winters. Day temperatures of more than a hundred degrees occur occasionally in summer. Night temperatures and humidity are also high much of the time with relatively little air movement. The transitional period from winter to summer is quite short and the period from about October 1 to the latter part of December is the most agreeable time of the year. The average length of the frost-free season from March 16, the average date of the latest killing frost, to November 13, the average date of the earliest in the fall, is 242 days.[4] Frost has been recorded as late as March 30 and as early as November 5.[5]

The normal monthly, seasonal, and annual temperature and precipitation as recorded by the United States Weather Bureau Station at Brookhaven, in Lincoln County, just west of Lawrence County, which adjoins Jefferson Davis County on the west are given in Table 3. These data probably are representative of the climatic conditions in Jefferson Davis County.

The records show a mean annual temperature of 66.7 degrees F. While the temperature has ranged from a minimum of minus 10 degrees F. to a maximum of 107 degrees F.,[6] the average winter mean for 1950 was about 58 degrees F. or 7.1 degrees F. above normal while the average summer mean that year was about 78 degrees F. or 3 degrees below normal. Temperature during the survey year, 1950, averaged lower than normal most of the months. May and October were

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[4] "Climate and Man," **Yearbook of Agriculture, 1941, U. S. Department of Agriculture,** p. 936.

[5] "Climatological Data," Mississippi, **Reports of the Weather Bureau, U. S. Department of Commerce,** Annual Summaries, 1949 and 1950, (Washington, D. C.)

[6] "Climate and Man," **Yearbook of Agriculture, 1941, U. S. Department of Agriculture,** p. 936.

Table 3. Monthly, seasonal and annual temperature and precipitation and departures from the normals at Brookhaven, Lincoln County, Mississippi, 1950.* Elevation 500'

	Temperature		Precipitation	
Month	Mean	Departure from normal	Total	Departure from normal
	°F.	°F.	Inches	Inches
December, 1949	54.1	3.7	**	**
January, 1950	61.9	12.1	11.85	6.36
February	57.5	5.5	5.69	0.42
Winter	57.8	7.1	—	—
March	55.6	—3.5	10.05	4.80
April	62.3	—3.5	5.80	0.38
May	75.1	2.0	8.01	3.17
Spring	64.3	—1.7	23.86	8.35
June	78.3	—1.6	5.09	0.65
July	78.8	—3.0	9.30	3.73
August	78.0	—3.4	4.07	—0.60
Summer	78.4	—2.6	18.46	3.78
September	74.9	—2.4	2.17	—1.05
October	68.8	1.8	2.50	—0.52
November	54.7	—2.2	1.98	—1.94
Fall	60.1	—1.0	6.65	—3.51
Year	66.7	—0.5	—	—

*"Climatological Data," Mississippi, **Report of the Weather Bureau, U. S. Department of Commerce,** Annual Summaries, 1949 and 1950, (Washington, D .C.)

**No record.

the only months following the winter period in which the temperature averaged above normal.

The mean annual precipitation of Jefferson Davis County is 55 inches.[7] The rainfall is well distributed throughout the year. The autumn is drier than the spring or summer, allowing the farmer good weather in which to harvest his crops. A long growing season and an abundant, well distributed moisture are important factors in the production of crops. Precipitation during the survey year was excessive throughout the early part of the growing season. This encouraged the growth of boll weevils and hindered the poisoning efforts. Contrarily the abundant rainfall was beneficial to corn and other crops. The dry period during the latter portion of the growing season resulted in the wilting and shedding of cotton leaves and bolls which reduced the cotton yield markedly.

Fogs, generally in the early mornings and lasting but an hour or two, occasionally occur. Most of the time sunshine is abundant; an average of almost one-half of the days of the year are classified as clear days.

Southerly winds are prevalent during much of the year, but winds are mostly northerly in winter. Thunderstorms accompanied by winds of damaging velocity occur occasionally as do tropical hurricanes and tornadoes.

Markets

Prentiss, the principal urban center and county seat, has a population of 1,212 in 1950, or about 8 percent of the total population of the county of 15,500. There are three cotton gins in this town and a number of others well distributed throughout the area. Most of the farmers sell their cotton at harvest time to local buyers at the gin. Cucumbers are purchased through the Prentiss salting station of Brown-Miller Company of New Orleans. Prices are guaranteed on contract before planting. Pulpwood, masonite wood and ties are shipped from Prentiss; timber is sold to local sawmills. Livestock is auctioned at the Jefferson Davis Livestock Association at Prentiss.

Transportation

Jefferson Davis County is well supplied with roads. It is traversed by the following State highways: number 13 in a northerly-southerly direction, 84 in an easterly-westerly direction, and 42 diagonally. Other hard-surfaced roads reach many other parts of the locality. County-maintained sand-clay roads are passable throughout the year.

The area is adequately supplied with railroad transportation facilities. Several branches of the Mississippi Central Railroad cross the county. These railroads played an important part in the early development of commercial agriculture in this county, especially in connection with the transportation of cotton and timber before the construction of present-day highways, and before the truck came into general use for supplying transportation requirements.

Tenure

The tenure position of Jefferson Davis County farmers has improved significantly in the last decade. The number of tenant-operated farms in the county decreased from 1,480 in 1940 to 966 in 1950, Table 4. Data from the 1950 census show that only 35.5 percent of the farms were operated by tenants compared with 51.6 percent for Mississippi. During the same period, croppers declined from 966 or 34.1 percent to 395 or 14.5 percent of the farms. In 1940 half of the farms in the county were operated by tenants compared with one-third of the farms in 1950.

Tenants on Jefferson Davis County farms reached their highest peak since 1920 in 1930. At that time 1,670, or 57.3 percent of the farms, were operated by tenants. The rate of tenancy has declined steadily since the depression period.

Part ownership has increased during the last ten years. In 1950, 64.5 percent of the farms in the county were operated by owner and manager groups (full owners, part-owners and managers), compared with 47.8 percent in 1940. In addition to climbing the "agricultural ladder," Jefferson Davis County farmers have increased the average size of farms operated. The average size of farm in 1950 was 79.5 acres compared with 68.1 acres a decade prior.

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[7] "Climate and Man," **Yearbook of Agriculture, 1941, U. S. Department of Agriculture,** page 936.

Number and Proportion of Farm Operators by Color

Preliminary data from the 1950 census show that 1,494, or about 55 percent, of the farm operators in Jefferson Davis County were non-white, and 1,229, or 45 percent, were white, Table 5, while in Mississippi 51 percent of the operators were white and 49 percent non-white.

Both in the State and in Jefferson Davis County the proportion of white operators was greater in 1950 than in 1930. The proportion of non-white operators has declined since 1930. This decrease has been due to the migration of non-white renters and cropper from farms to cities.

Since 1930 the total number of operators in Jefferson Davis County, white and non-white, has declined approximately 7 percent. Non-white operators during this same period decreased about 12 percent while the white operators increased about 2 percent. For the State the total number of operators, white and non-white, has declined approximately 20 percent since 1930, but white operators declined 1 percent and non-white operators declined 33 percent.

Land in Farms

The acreage in farms in Jefferson Davis County totaled 216,354 acres or 81.7 percent of the approximate land area of 264,960 acres, according to the U. S. Census of 1950. The acreage in farms totaled 176,215 as reported by the Census of 1930; 193,025 in 1940; and 216,354 in 1950.

Thirty and one-half percent of the land in farms was used for harvested crops; 46.8 percent was in woodland, pastured and not pastured; 7.2 percent was in plowable pasture; 6.9 percent in other pasture; 5.4 percent in cropland not harvested and not pastured; and 3.2 percent in other uses. The woodland, pastured and not pastured, was approximately one-and-one-half times as large as the cropland harvested. The acreages of woodland, pastured and not pastured, and cropland harvested were 101,134 and 65,970, respectively, Table 6.

Table 4. Tenure on farms, Jefferson Davis County, Mississippi, 1920-1950.

	Number of farms*				Percent of farms			
Tenure group	1920	1930	1940	1950	1920	1930	1940	1950
Full owners	1,229	1,139	1,266	1,464	54.1	39.1	44.7	53.8
Part owners	97	102	85	292	4.3	3.5	3.0	10.7
Managers	5	2	2	1	0.2	0.1	0.1	0.0
Tenants:								
Cash tenants	41	113	180	74	1.8	3.9	6.3	2.7
Other tenants**	900	1,557	1,300	892	39.6	53.4	45.9	32.8
Total tenants	941	1,670	1,480	966	41.4	57.3	52.2	35.5
Total	2,272	2,913	2,833	2,723	100.0	100.0	100.0	100.0

*U. S. Census of Agriculture, 1920, 1930, 1940 and 1950.

**Includes share-cash tenants, share tenants, croppers and other unspecified tenants.

Table 5. Number and proportion of farm operators by color, Jefferson Davis County and Mississippi, 1930-1950.

	Number of farms*			Percent of farms		
Item	1930	1940	1950	1930	1940	1950
Jefferson Davis County:						
White operators	1,207	1,304	1,229	41	46	45
Non-white operators	1,706	1,529	1,494	59	54	55
Total	2,913	2,833	2,723	100	100	100
Mississippi:						
White operators	129,775	131,552	128,294	42	45	51
Non-white operators	182,888	159,540	123,089	58	55	49
Total	312,663	291,092	251,383	100	100	100

*U. S. Census of Agriculture, 1930, 1940 and 1950.

Table 6. Major uses of land in farms, Jefferson Davis County, Mississippi, 1949.*

Use of land	Acres	Percent
Cropland harvested	65,970	30.5
Cropland used only for pasture	15,520	7.2
Cropland not harvested and not pastured	11,767	5.4
Woodland pastured	50,546	23.4
Woodland not pastured	50,588	23.4
Other pasture (not cropland and not woodland)	15,026	6.9
Other land	6,937	3.2
Total	216,354	100.0

*U. S. Census of Agriculture, 1950.

The proportion of harvested crop acreage used for corn amounted to 46.6 percent; for cotton, 41.6 percent; hay, 4.1 percent; small grains, 1.9 percent; cowpeas, 1.8 percent; cucumbers, 0.9 percent; and all other, 3.1 percent, Table 7. Stated another way, approximately seven-eights of the crop acreage harvested included the row crops, corn and cotton, and the remaining one-eighth included hay, small grains, cowpeas, cucumbers and all other crops. The acreage control program of the Agricultural Adjustment Administration on cotton resulted in a smaller cotton acreage than most farmers would have planted in 1950.

Livestock

Cattle, hogs and chickens were the principal productive livestock kept on farms in Jefferson Davis County in 1950. On April 15, the number of cows and heifers averaged 4.1 per farm or 5.1 per 100 acres of farm land; other cattle and calves averaged 1.5 per farm or 1.9 per 100 acres. For the same period all other hogs and pigs averaged 3.0 per farm or 3.7 per 100 acres. Sows and gilts averaged 0.2 per farm or 0.3 per 100 acres of farm land. The number of chickens 4 months old and over averaged 25 per farm or 31.5 per 100 acres, Table 8.

Horses and mules, including colts, averaged 1.6 per farm or 2.0 per 100 acres. Of this number, approximately 13 percent were horses and horse colts.

FARM PRICES AND COSTS IN 1950

The United States index of prices paid by farmers for items of expense in their operations, compared with the prices in the base period as 100, was 255 for the year 1950. For the same base period the index of prices received for products in Mississippi was 240, thus making the prices received in Mississippi equal to 94 percent of the prices paid for commodities in the United States. The United States percentage of prices received to prices paid, using the 1910-14 base period, was 100 in 1950.

The 1950 index of the average price received at the farm for cotton in Mississippi, using 1910-14 as the base period, was 280. Since cotton was the principal crop sold by farmers in Jefferson Davis County, and since this index exceeded the index of prices paid by farmers, prices received by the farmers in the area surveyed were a slightly more favorable factor affecting farming returns in 1950 than they were at any time in the past 30 years, Figure 2.

Table 7. Acreage of important crops and percentages of total crops harvested, Jefferson Davis County, Mississippi, 1949.*

Kind of crop	Acres	Percent
Corn	30,753	46.6
Small grains	1,242	1.9
Cowpeas	1,155	1.8
Hay	2,703	4.1
Cotton	27,467	41.6
Cucumbers	617	0.9
All other	2,033	3.1
Total	65,970	100.0

*U. S. Census of Agriculture, 1950.

Table 8. Livestock numbers, number per farm and number of livestock per 100 acres of farm land, Jefferson Davis County, Mississippi, 1949.*

Class of livestock	Total number	Number per farm	Number per 100 acres
Cows and heifers	11,125	4.1	5.1
Other cattle and calves	4,176	1.5	1.9
Hogs and pigs	8,058	3.0	3.7
Sows and gilts	660	0.2	0.3
Chickens 4 months old and over	68,156	25.0	31.5
Horses and mules including colts	4,268	1.6	2.0

*U. S. Census of Agriculture, 1950.

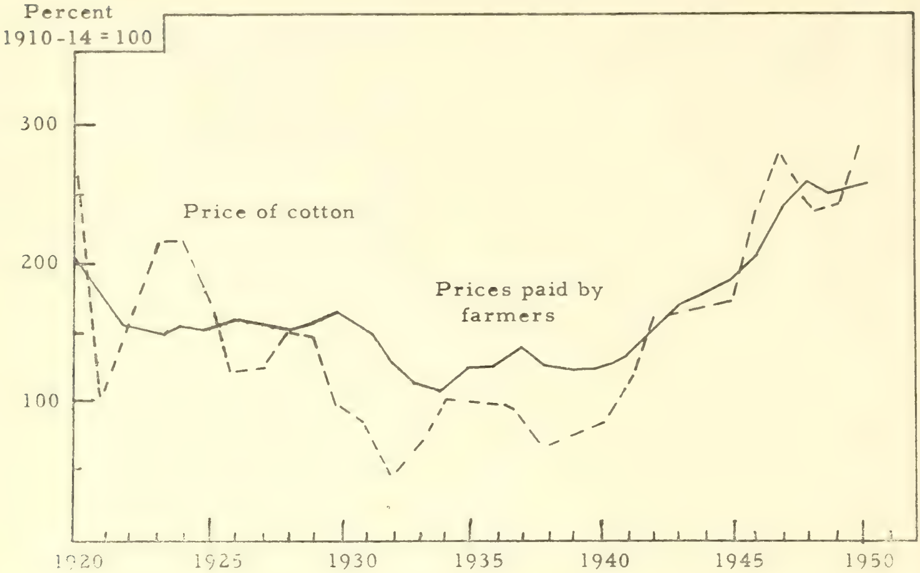

Figure 2. Index of Mississippi farm prices for cotton and prices paid by United States farmers including interest and taxes. (1910-14=100)*

*Farm Economics, Nos. 77-185, published by New York State College of Agriculture, Cornell University and **Agricultural Statistics**, 1951, United Department of Agriculture publication, Washington, D. C.

SYSTEM OF FARMING AND ORGANIZATION OF THE THE FARM BUSINESS

System of Farming

The cotton system of farming predominates in Jefferson Davis County as well as throughout much of Mississippi. It is a system in which cotton production is planned as the major source of cash income. Other crops and livestock are included in the farm organization mainly with the view of providing food for the farm family labor and feed for the workstock. Occasional surpluses of the products from these enterprises are sold. Some of the advantages of this system of farming are: it yields a high return per acre of land used; it is quite easily followed; the capital requirements are low. A disadvantage of the cotton system of farming is the high seasonal labor requirements. The fact that cotton in this area requires a large amount of hand labor limits the acreage which can be grown by the family. These farms require large amounts of labor during the spring planting, the chopping and the harvesting periods. At other times of the year, little employment is provided for labor by the system. Most of the farms have enough surplus labor available at times to develop small livestock enterprises or woodlots.

Size of Farms and Use of Land

Most of the farms in Jefferson Davis County were family operated, and the acres cultivated were insufficient to give large returns. The average area of farms included in this survey was

Table 9. Use of land, 155 farms, Jefferson Davis County, Mississippi, 1950.

Use of land	Acres per farm	Percent of land
Crops harvested	31.0	35.7
Idle land	13.5	15.6
Woods	33.1	38.2
Open pasture	6.4	7.4
Farmstead, roads, etc.	1.6	1.8
Wasteland	1.1	1.3
Total	86.7	100.0

86.7 acres, of which 31.0 acres were in crops, 33.1 in woods, 13.5 idle, 6.4 open pasture, 1.6 farmstead and roads and 1.1 acres of wasteland, Table 9.

The average acreages of the more important crops for farms surveyed are given in Table 10. The principal intertilled crops grown were corn and cotton, the largest acreages of hay were lespedeza and mixed hay, and the leading temporary grazing crop was oats. Corn occupied the largest share of the crop acreage and amounted to 14.8 acres per farm, 45.7 percent of the total crop area, and 62.6 percent more than the cotton acreage. Cotton was next with 9.1 acres per farm, or 28.2 percent of the cropland. Corn and cotton were grown on all farms included in this study and occupied approximately three-fourths of the cropland. Cucumbers, which were grown on three-fourths of the farms accounted for about 1.6 percent of the total crop area. Sugarcane, peanuts, sweet potatoes and watermelons, mainly for home use, were grown on many of the farms. A few farms sold peppers. Income from these minor crops was used to supplement the family income during the period when sales of other products were least.

Crop Yields

Yields of corn and cotton on the farms surveyed were low in 1950 compared with yields for Mississippi, Table 11. But 1950 was a dry year in the area. The yield of cotton was approximately 75 percent, corn, 85 percent; sugarcane, 102 percent; sweet potatoes, 119 percent; and peanuts, 121 percent

Table 10. Acreage and relative importance of crops grown, 155 farms, Jefferson Davis County, Mississippi, 1950.

Crops	Average area per farm: All farms	Average area per farm: On farms reporting	Farms on which grown	Proportion of total acres of crops
	Acres	Acres	Number	Percent
Cotton	9.1	9.1	155	28.2
Corn	14.8	14.8	155	45.7
Oats for grazing	0.8	3.3	36	2.4
Other crops grazed	0.2	2.2	11	0.5
Oats for grain and straw	0.1	3.4	7	0.5
Hay:				
Cowpea	0.3	1.9	22	0.8
Lespedeza Serecia	0.5	2.4	30	1.4
Alyce Clover	0.2	4.0	5	0.4
Soybean	0.2	1.7	19	0.6
Mixed	0.5	2.5	33	1.6
All other hay	0.1	1.2	18	0.4
Total hay	1.8	—	—	5.2
Sugar cane	0.3	0.4	115	1.0
Peanuts	0.4	0.5	117	1.1
Crowder peas	0.8	1.3	93	2.4
Sweet potatoes	0.4	0.4	147	1.3
Watermelons	0.4	0.6	96	1.1
Cucumbers	0.5	0.7	121	1.6
Peppers	0.1	0.8	20	0.3
Garden	0.4	0.5	151	1.4
Orchard	0.2	0.5	44	0.5
Cover crops (Austrian peas, etc.)	2.1	7.3	44	6.4
All other crops	0.1	0.6	34	0.4
Total	32.5	—	—	100.0

Table 11. Yield per acre of selected crops, 155 farms, Jefferson Davis County, Mississippi, 1950.

Crops harvested	Unit	Yield per acre: 155 farms surveyed	Yield per acre: Mississippi, 1950*	Percent of state yield
Cotton	Pounds	241	320	75.3
Corn for grain	Bushels	22	26	84.6
Sugar cane for syrup	Gallons	133	130	102.3
Sweet potatoes	Bushels	119	100	119.0
Peanuts	Bushels	23	19	121.1
Hay:				
Lespedeza	Tons	1.2	1.3	92.3
Mixed	Tons	0.8	1.5	53.3

*Agricultural Statistics, 1951, U.S. Department of Agriculture publication, Washington, D. C.

Table 12. Numbers and values of livestock per farm, 155 farms, Jefferson Davis, County, Mississippi, 1950.

Kind of livestock	Average per farm Number	 Value
Dairy cattle*	3.7	$479
Other cattle	1.6	113
Hogs	4.0	98
Poultry	47.0	49
Mules and horses**	2.3	195

*Includes heifers more than 6 months old.

**Includes colts.

of the State average. The yield of lespedeza hay was slightly below the State average, and the yield of mixed hay, one-half of the State average.

Livestock

The lack of good pasture is perhaps responsible for the small number of livestock in Jefferson Davis County. The farms surveyed kept an average of 3.7 dairy cows with a total value of $479, 4 hogs valued at $98 and 47 chickens valued at $49, Table 12. Dairy cattle were kept primarily to supply the family needs for dairy products. Hogs and poultry were kept mainly for home use. Some sales of pork, poultry and eggs were made. The county is well adapted to poultry production and this enterprise, as a part of the farm plan, paid well where good poultry management was practiced. Horses or mules were kept on all farms and averaged 2.3 per farm with a total value of $195.

Equipment

The equipment used on these farms had an average value at the end of the year 1950 of $786 per farm, Table 13. Of this amount $211, or 27 percent, of the total value of the equipment was represented by mule-drawn equipment. Most of the farms surveyed had a one-horse plow, middle-buster, row planter and wagon. Thirty-six farms reported trucks with an average value of $841 per farm reporting, or $195 for all farms. This kind of equipment amounted to 25 percent of the value of all equipment. The next most important type of equipment was automobiles. Forty-seven farms reported automobiles used for farm purposes, with an average value of $541 per farm reporting, or $164 for all farms. Only nine farmers owned tractors. The value of tractors and tractor equipment averaged $2,038 for the nine farms, or $119 for all farms. Other equipment included shop equipment, poultry equipment, hog equipment, dairy equipment, water pumps, cane mills, small tools and hand cotton poison machines, with an average value of $97 per farm, or 12 percent of the total value of equipment on the farms studied.

Table 13. Value of equipment at end of the year, 155 farms, Jefferson Davis County, Mississippi, 1950.

Kind of equipment	Farms reporting	Value per farm Where reported	 All farms	Proportion of total value
	Number	Dollars	Dollars	Percent
Automobiles (farm share)	47	541	164	20.9
Trucks	36	841	195	24.8
Tractors and tractor equipment	9	2,038	119	15.1
Mule drawn equipment:				
Wagons	120	68	53	6.7
Harnesses	152	29	28	3.6
Plows, 1 H.	155	25	25	3.2
Plows, 2 H.	69	17	8	1.0
Middle busters	142	19	17	2.2
Discs	37	48	12	1.5
Row planters	122	20	16	2.0
Fertilizer distributors	77	14	7	0.9
Cultivators, ½ R.	77	15	7	0.9
Cultivators, 1 R.	3	48	1	0.1
Stalk cutters	33	33	7	0.9
Harrows	76	15	7	0.9
Mowers	31	81	16	2.0
Rakes	24	42	6	0.8
Grain drills	1	18	0	0.0
Hay balers	3	46	1	0.1
Buggies	2	20	0	0.0
Total mule-drawn equipment	—	—	211	26.8
Other equipment	155	97	97	12.4
Total equipment	155	—	786	100.0

FINANCIAL RETURNS ON THE FARMS SURVEYED

Amount, Distribution and Variation in Farm Capital

The total capital used in the farm business averaged $6,049 per farm, $70 per acre of land operated, and $137 per arce of cropland, Table 14. Of the total, $4,253, or 70 percent, was in real estate and averaged $49 per acre operated or $97 per acre of cropland; 15 percent was in livestock valued at $11 per acre operated, or $21 per acre of cropland; 10 percent was in machinery and equipment valued at $7 per acre operated, or $13 per acre of cropland; and 5 percent was in feed and supplies that averaged $3 per acre operated, or $6 per acre of cropland. The buildings on the farms studied were better than the average among Negro farmers for the State and accounted for a significant portion of the real estate value.

Individual farm capital varied widely with a difference of $20,309 between the lowest and the highest. The most frequent size of business as indicated by total capital was from $3,500 to $4,999 and included 23.2 percent of the total number of farms, Table 15. Approximately 64 percent of the farms had less than $6,500 of total capital.

Amount, Distribution, and Variation in Total Receipts

Receipts amounted to $2,113 per farm, Table 16. Total crop sales amounted to slightly less than one-half of the total gross receipts.

The dominance of cotton is emphasized by the fact that approximately one-third of the gross income, or $777 per farm, came from the sale of lint cotton, while an additional $94, or 4 percent, came from the sale of cottonseed. Cucumbers for pickles, reported on 118 farms was the next leading source of crop income and amounted to $69 per farm or 3 percent of the gross receipts. Other crop sales were not important for the farms as a whole.

The sale of livestock and livestock products was the next most important source of cash receipts and amounted to $249 per farm, or approximately 12 percent of the total income. More than one-half of this income was accounted for by cattle sales reported by 80 farmers.

Sale of forest products averaged $108 per farm or 5 percent of the total receipts. One hundred and three farmers reported income from this source. Approximately 13 percent of the receipts was from increase in inventory. Most of this increase resulted from an

Table 14. Amount and distribution of farm capital, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Value per farm	Proportion of total capital	Value per acre operated	Value per acre of cropland
	Dollars	Percent	Dollars	Dollars
Real estate	4,253	70.3	49	97
Livestock	933	15.4	11	21
Machinery and equipment	578	9.6	7	13
Feed and supplies	285	4.7	3	6
Total	6,049	100.0	70	137

Table 15. Variation in total capital represented, 155 farms, Jefferson Davis County, Mississippi, 1950.

Total capital				
Range	Average	Farms	Proportion of farms	Cumulative proportion of total number of farms
Dollars	Dollars	Number	Percent	Percent
Less than 2,000	1,566	2	1.3	1.3
2,000 - 3,499	2,798	31	20.0	21.3
3,500 - 4,999	4,288	36	23.2	44.5
5,000 - 6,499	5,871	31	20.0	64.5
6,500 - 7,999	7,146	28	18.1	82.6
8,000 - 9,499	8,751	11	7.1	89.7
9,500 - 10,999	10,460	4	2.6	92.3
11,000 - 12,499	11,530	4	2.6	94.9
12,500 or more	15,882	8	5.1	100.0
Total or average	6,049	155	100.0	—

Table 16. Amount and sources of receipts, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Farms reporting	Amount per farm		Proportion of total receipts
		Where reported	All farms	
	Number	Dollars	Dollars	Percent
Crops:				
Cotton	155	777	777	36.8
Cottonseed	154	94	94	4.4
Corn for grain	21	116	16	0.8
Sugar cane (syrup)	36	39	9	0.4
Hay	1	10	0	0.0
Peanuts	35	21	5	0.2
Cucumbers	118	90	69	3.2
String beans	10	86	5	0.3
Sweet potatoes	12	64	5	0.2
Irish potatoes	4	76	2	0.1
Watermelons	22	113	16	0.8
Peppers	18	99	11	0.5
Crowder peas	33	46	10	0.5
Garden vegetables and fruit	14	29	3	0.1
Total crops	—	—	1,022	48.3
Livestock and products:				
Cattle	80	256	132	6.2
Hogs	52	61	21	1.0
Poultry and eggs	116	38	28	1.3
Workstock*	14	588	53	2.5
Milk and other livestock products	50	43	14	0.7
Breeding fees	15	14	1	0.1
Total livestock and products	—	—	249	11.8
Forest products:				
Lumber, logs and wood	103	163	108	5.1
Work off the farm:				
Team, truck and machine work	36	376	87	4.1
Man-work off farm	64	347	143	6.8
Total work off farm	—	—	230	10.9
Miscellaneous:				
On farm Veteran's allowance	20	1,189	153	7.3
Other	60	192	75	3.5
Total miscellaneous	—	—	228	10.8
Total cash receipts	155	—	1,837	86.9
Net increase in inventory	110	389	276	13.1
Total gross receipts	155	—	2,113	100.0

*Includes two farmers who were livestock dealers.

increase in feed and supplies and in livestock values.

Receipts from work off the farm comprised 11 percent of total receipts, Approximately 40 percent of the farmers reported an average income of $143 per farm from man-work off the farm. This income was from wages earned working on neighboring farms and in non-farm work. Team, truck and machine work amounted to approximately 4 percent of the gross income and was reported by 36 of the farmers. Miscellaneous receipts other than receipts previously indicated averaged $228 per farm. About two-thirds of this income was from Federal benefits paid to Veterans.

Receipts on individual farms varied considerably. The smallest amount of receipts taken in during the year was $355 while the largest was $10,435. Fourteen percent of the farms surveyed had less than $1,000 total receipts, Table 17. Forty-five percent of the farmers interviewed had total receipts between $1,000 and $1,999. Approximately four-fifths of the farmers had total receipts of less than $2,999 while only 4 percent of the farmers had total receipts of $5,000 or more.

Amount and Composition of Farm Expenses

The total farm expenses, excluding the interest charge on capital used and any charges for the farmer's time, averaged $1,341 per farm of which $835 was cash and $506 was non-cash items,

In computing the farm expenses, interest on the capital and the value of the operator's or farmer's time have

Table 17. Variation in total receipts, 155 farms, Jefferson Davis County, Mississippi, 1950.

Total receipts*				
Range	Average	Farms	Proportion of farms	Cumulative proportion of total farms
Dollars	Dollars	Number	Percent	Percent
Less than 1,000	700	21	14	14
1,000 - 1,999	1,415	70	45	59
2,000 - 2,999	2,474	36	23	82
3,000 - 3,999	3,471	14	9	91
4,000 - 4,999	4,430	8	5	96
5,000 or more	7,848	6	4	100
Total	2,154	155	100	—

*Includes increases but not decreases in inventories.

been omitted. Unpaid family labor, the largest single item, averaged $506 per farm or 37.7 percent of the total farm expenses. Hired labor averaged $36 per farm or 2.7 percent of the total expenses. Thus, unpaid family labor and hired labor amounted to an average of $542 per farm or 40.4 percent of the total expenses. Fertilizer was the next largest item averaging $210 per farm or 15.7 percent. Labor, excepting the operator, and fertilizer amounted to more than half of the farm expenses.

The purchase of new equipment, the repairs and the maintenance of equipment comprised the third largest item of farm expense and averaged $147 per farm or 11.0 percent of the total. Upkeep of buildings was the next largest expense. Labor, fertilizer, equipment and upkeep of buildings was almost three-fourths of the total.

Livestock purchased ranked fifth and averaged $86 per farm or 6.4 percent of the expense; feed purchased, sixth and averaged $61 per farm or 4.5 percent. No other item was more than 4 percent of the total farm expense.

Returns from Farming

Many different measures of returns from farming have been developed by farm management workers. Of these, the operator's farm income, operator's labor income, operator's labor earnings, and return on capital are the ones most commonly used and most important in this area. There is no one best measure of the financial returns from farming. The particular measure of financial returns to use in studying farm businesses depends upon what one desires to learn about them.

If a farmer were out of debt he might maintain a good standard of living even though his labor income were nothing. He would then be living on the earnings of his capital and donating his own time. But to be successful a farm business should pay for all labor and the use of capital without depreciation in value. It is usually desirable to know what the farmer is getting as total pay for his own labor. If the estimated value of the use of the house as a family dwelling and the value of the products which the farm furnished the family are added to the farmer's labor income, the operator's labor earnings result. The return that is made on the farm capital may be the most desirable measuer of income to use in cases where there is an exceptionally large amount of capital represented by the farm business.

Operator's Labor Income: Receipts exceeded expenses by $772 per farm, Table 19. This is the amount left as compensation for the use of capital and to pay for the farmer's own time. In order to make fair farm-to-farm comparisons, an interest charge on the total farm capital represented was deducted, regardless of the amount of indebtedness on individual farms. This interest charge, at the rate of 5 percent, amounted to $303 per farm which, when deducted from the farm income of $772, left an average labor income of $469 as the year's pay for the farmer's work and management. This labor income of the operator amounted to $78 per $1,000 invested in capital, $35 for each $100 of expenses, and $22 for each $100 of receipts. Although price conditions were more favorable to farmers in Jefferson Davis County than during the previous 30 years, they still

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Table 18. Amount and composition of farm expenses, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Average amount per farm	Proportion of total expenses
	Dollars	Percent
Labor except operator:		
Unpaid family	506	37.7
Hired:		
Cotton picking	21	1.6
Wage hands and croppers	4	0.3
Day labor	10	0.7
Board for labor	1	0.1
Total hired labor	36	2.7
Total hired and unpaid labor except operator	542	40.4
Fertilizer	210	15.7
Equipment, new, repairs and maintenance	147	11.0
Repair buildings	90	6.7
Feed purchased:		
Hay and prepared feed for work stock	21	1.5
Poultry feed, prepared	13	1.0
Cattle feed, prepared (including cottonseed meal)	16	1.2
Hog feed, prepared	8	0.6
Corn, grain	3	0.2
Total feed purchased	61	4.5
Gas, oil, grease, etc.	46	3.4
Ginning cotton	33	2.5
Seeds and seed treatment	28	2.1
Repair fences, drains, terraces and pond construction	14	1.0
Poison for cotton	21	1.6
Taxes	16	1.2
Insurance, crops and buildings	11	0.8
Custom work, including cutting and sawing wood	8	0.6
Blacksmithing	6	0.4
Veterinary medicine, breeding and registration fees	5	0.4
Livestock purchased	86	6.4
Miscellaneous	17	1.3
Total farm expenses	1,341	100.0
Non-cash expenses	506	37.7
Cash expenses	835	62.3

were not good enough so that the average farmer made a good income. In addition to this labor income of $39 per month, the farmer had the use of a house and products from the farm for family living.

While the average labor income was low, individual incomes showed much variaton. The difference between the lowest and the highest was $4,378. Thirty percent of those interviewed in 1950 did not receive enough to provide anything for their own time and management, Table 20. The largest group, those within a range of $200, had a labor income of from minus $200 to 0 and included about 19 percent of the farms. One percent of the farms had minus labor incomes of more than $800, while 23 percent had labor incomes of $800 or more. A minus labor income means that not only did the operator make nothing for his time but lacked that much of receiving 5 percent on the capital represented.

Farm P~~r~~er~~e~~quisites: The value of products grown and consumed on the farm is an important supplement to the cash income on most farms in Jefferson Davis County. The estimated value of farm-furnished products averaged $573 per farm on the 155 farms, Table 21. In addition, the use of the dwelling was valued at $142 for the year. Vegetables, pork, poultry and milk were the principal items of food obtained from the farm. The average value of privileges per farm was: fruits and vegetables, $165; use of dwelling, $142; poultry and egg products, $100; meat products, $80; meal and sorghum and cane syrup, $65; milk, $61; wood, $35; and peanuts and pecans, $18. In 1950 privileges comprised approximately 60 percent of operator's earnings on the farms surveyed.

Quantities of the principal items, except vegetables, produced on the farm and used by the operator's household are given in Table 22. Meal, pork,

Table 19. Capital, receipts, expenses and labor returns per farm, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Per farm	Percent	Per $1,000 capital	Per $100 expense	Per $100 receipts
Capital	$6,049	—	—	$451	$286
Receipts:					
Non-cash:					
Increase in inventory	276	13.1	$ 46	21	—
Cash:					
Crops	1,021	48.3	169	76	—
Livestock and products	249	11.8	41	19	—
Forest products	108	5.1	18	8	—
Work off the farm	231	10.9	38	17	—
Miscellaneous	288	10.8	38	17	—
Total cash	$1,837	86.9	$304	$137	—
Total receipts	$2,113	100.0	$350	$158	—
Expenses:					
Non-cash:					
Value of family labor except operator	$ 506	37.7	$ 84	—	$ 24
Cash:					
Labor hired and value of board*	36	2.7	6	—	2
Fertilizer	210	15.6	35	—	10
Other expenses	589	44.0	97	—	28
Total expenses	$1,341	100.0	$222	—	$ 64
Farm income (pay for use of capital and operator's time)	$ 772	—	$128	$ 58	$ 36
Interest on capital at 5 percent	$ 303	—	$ 50	$ 23	$ 14
Labor income	469	—	78	35	22
Operator's family privileges	715	—	118	53	34
Operator's labor earnings	1,184	—	196	88	56
Operator's labor earnings plus other family labor	1,690	—	279	126	80
Value of operator's time	1,346	—	223	100	64
Return on capital	—574	—	—95	—42	—28
Percent return on capital	—9.5	—	—	—	—

*Includes cash and non-cash part of board for labor.

Table 20. Variation in operator's labor income, 155 farms, Jefferson Davis County, Mississippi, 1950.

Labor income		Farms	Proportion of the farms	Cumulative proportion of the farms
Range	Average			
Dollars	Dollars	Number	Percent	Percent
Less than —800	—998	2	1	1
—800 - —601	—647	1	1	2
—600 - —401	—514	5	3	5
—400 - —201	—308	10	6	11
—200 - 0	—101	29	19	30
0 - 199	109	19	12	42
200 - 399	313	19	12	54
400 - 599	505	20	13	67
600 - 799	715	15	10	77
800 - 999	910	6	4	81
1,000 - 1,199	1,104	3	2	83
1,200 - 1,399	1,327	7	4	87
1,400 - 1,599	1,461	4	3	90
1,600 - 1,799	1,723	5	3	93
1,800 - 1,999	1,818	3	2	95
2,000 or more	2,446	7	5	100
Total	469	155	100	—

milk, poultry and sweet potatoes were the main items furnished the household by the farm. Beef for home consumption was of minor importance on these farms.

Operator's Labor Earnings: Farm privileges, the use of a house and products from the farm for family living, amounted to $715 per farm, Table 21. The value of these privileges when added to the operator's labor income gives an increase called labor earnings. The labor earnings, as returns to the farmer both in money and privileges,

Table 21. Value of farm products furnished the operator's household, 155 farms, Jefferson Davis County, Mississippi, 1950.

Unit	Farms reporting	Value per farm		Proportion of total value
		Where reported	All farms	
	Number	Dollars	Dollars	Percent
Fruit	67	23	10	1.4
Sweet potatoes	150	48	47	6.6
Vegetables	155	155	155	21.7
Corn meal	154	36	36	5.0
Peanuts	122	21	17	2.3
Sorghum syrup	1	25	0	0.0
Sugar cane syrup	106	43	29	4.1
Pecans	21	10	1	0.2
Milk	144	66	61	8.6
Eggs	151	37	36	5.0
Meat:				
Beef	2	38	0	0.0
Pork	145	86	80	11.3
Poultry	151	66	64	9.0
Wood	147	36	35	4.8
Other	21	11	2	0.2
Total products used	155	—	573	80.2
Use of dwelling	155	142	142	19.8
Total privileges	155	—	715	100.0

Table 22. Average amount of farm products furnished the operator's household, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	Farms reporting	Amount per farm	
			Where reported	All farms
		Number	Number	Number
Fruit	bushels	67	8	3
Sweet potatoes	bushels	150	24	23
Vegetables		155	*	*
Corn meal	pounds	154	600	596
Peanuts	bushels	122	9	7
Sorghum syrup	gallons	1	25	0
Sugar cane syrup	gallons	106	43	29
Pecans	bushels	21	2	0
Milk	quarts	144	328	305
Eggs	dozens	151	123	120
Meat:				
Beef	pounds	2	203	3
Pork	pounds	145	531	497
Poultry	each	151	66	64
Wood	cords	147	7	7
Butter	pounds	19	21	3

*Amount consumed not available.

amounted to $1,184 per farm. The operator's labor earnings amounted to $196 per $1,000 of capital; $88 per $100 of expense; and $56 for each $100 of receipts.

Return on the Capital: The average value which operators placed on their own time was $1,346, Table 19. This was subtracted from the farm income to obtain the return on the capital invested. This gave a minus return on capital of $574. Stated another way, had the operators been paid for their time the amounts which they estimated their work would have cost if hired, the average income lacked $574 of returning anything for the use of the capital invested in the farm business. The minus return on capital was $95 for each $1,000 invested, $42 for each $100 of farm expense, and $28 for each $100 of receipts. The average rate of any return on the capital was a minus 9.5 percent.

Farm Indebtedness

Seventy-three or slightly less than one-half of the 155 farms surveyed reported an average indebtedness of $530 at the end of the year 1950, Table 23. This averaged $250 per farm for all farms of which $180, or approximately 72 percent, was balances owed on real estate mortgages by about one-fourth of the farmers. Thus approximately three-fourths of the farmers owned their real estate free of debts. Accounts payable were the second largest kind of indebtedness and, on the basis of all of the farms, averaged $32 per farm. Thirty-seven farmers reported accounts payable that averaged $132 per farm. This source of credit comprised about 12.6 percent of the total debts. Eleven farmers reported chattel mortgages and eight reported other borrowings.

Operator's Personal Net Worth

The net worth is the amount by which the value of the assets exceeds that of the liabilities. When compared with the previous net worth statement, it tells whether the farmer has made financial progress for the year but does not tell why. A net worth statement for the farmers surveyed, showing both farm and personal assets and liabilities at the end of the year 1950, is shown in Table 24.

Assets exceeded liabilities by $7,131 per farm and averaged $386 per year of ownership and tenancy, or $228 per year of farm experience. Total assets were $7,381 per farm and amounted to $400 per year of ownership and tenancy, or $236 per year of farm experience. Real estate was $4,286 per farm or 58 percent of the total assets and averaged $232 per year of ownership and tenancy or $137 per year of farm experience. Livestock was the next most important asset and was $954 per farm or 13 percent of the total assets. Total liabilities were $250 per farm or $8 per year of farm experience. Real estate mortgages averaged $180 per farm or 72 percent of the total liabilities. Accounts payable were the second most important liability and amounted to $32 per farm or 13 percent of the total liabilities.

FARM BUSINESS FACTORS AFFECTING LABOR INCOME

Farm management studies have shown that the level of incomes of selected groups of farmers is influenced by (1) the system of farming, (2) the relationship between prices received for their products and prices paid for goods and services, such as fertilizer, wages, etc.; and (3) the organization of

Table 23. Types and amounts of farm indebtedness at the end of the year, 155 farms, Jefferson Davis County, Mississippi, 1950.

Kind of indebtedness	Farms reporting	Amount per farm		Proportion of total debts
		Where reported	All farms	
	Number	Dollars	Dollars	Percent
Real estate mortgage, amount unpaid	41	682	180	72.2
Chattel mortgage, amount unpaid	11	234	17	6.7
Accounts payable	37	132	32	12.6
Other borrowings	8	412	21	8.5
Total indebtedness	73*	530*	250	100.0

*Does not check with total of above because some farms have combinations of indebtedness.

Table 24. Net worth statement, December 31, 1950, 155 farms, Jefferson Davis County, Mississippi.

Item	Per farm at end of year	Proportion of total	Per year of ownership and tenancy*	Per year of farm experience
	Dollars	Percent	Dollars	Dollars
Assets:				
Real estate	4,286	58.1	232	137
Livestock	954	12.9	52	31
Equipment	622	8.4	34	20
Feed and supplies	337	4.6	18	11
Automobile	164	2.2	9	5
Furniture	606	8.2	33	19
Cash on hand and in bank	384	5.2	21	12
Other investments	28	0.4	1	1
Total assets	7,381	100.0	400	236
Liabilities:				
Real estate mortgage	180	72.2	10	6
Chattel mortgage	17	6.7	1	0
Accounts payable	32	12.6	2	1
Other borrowings	21	8.5	1	1
Total liabilities	250	100.0	14	8
Net worth	7,131	—	386	228

*Includes years tenant on the farm surveyed or another farm.

Table 25. Relation of productive-man-work units to returns and other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Productive-man-work units: Less than 236	236 to 335	More than 335
Farms studied	Number	155	49	49	57
Financial returns:					
Total receipts*	Dollars	2,154	1,332	1,930	3,054
Operator's labor income	Dollars	469	284	505	597
Operator's labor earnings	Dollars	1,184	855	1,204	1,451
Labor returns per man	Dollars	649	460	649	775
Size of business:					
Productive-man-work units	Units	314	186	281	452
Area operated	Acres	87	59	79	117
Area in crops	Acres	32	20	28	47
Area in cotton	Acres	9.1	5.7	7.8	13.3
Man equivalent	Number	1.6	1.4	1.5	1.8
Total capital	Dollars	6,049	3,916	5,514	8,342
Combination of enterprises or diversity:					
Proportion of receipts from—					
Cotton	Percent	40	46	37	40
Livestock	Percent	10	7	7	14
Proportion of crop area in cotton	Percent	28	28	27	28
Proportion of productive-man-work units on cotton	Percent	30	32	29	30
Production, labor, and capital efficiency:					
Crop yield index	Percent	122	132	126	109
Crop yield per acre	Pounds	241	271	233	222
Man-work units per man	Units	201	135	191	253
Crop acreage per man	Acres	20.9	14.6	19.3	26.1
Cotton acreage per man	Acres	5.9	4.1	5.3	7.4
Miscellaneous:					
Age of farm operator	Years	51	53	50	52
Total indebtedness	Dollars	250	94	341	305
Total expenses**	Dollars	1,383	852	1,149	2,040

*Includes increases but not decreases in inventories.

**Includes decreases but not increases in inventories.

the farm operations in terms of the size of the business, the rates of crop and livestock production, and labor efficiency and the combination of enterprises.[8]

Size of Business

Size of business is one of the important factors affecting farm income in Jefferson Davis County. In order to operate efficiently a farm business must be of a reasonable size or magnitude. For the farms studied the two most useful measures of the size of the farm business were total productive-man-work units, and the acres operated. The relationship of each of these to the financial returns was studied.

Productive-Man-Work Units: Total productive-man-work units is probably the best general measure of the size of the farm business. It takes into account the crops and livestock and other income-producing work on the farm. The definition of a man-work unit is included in the definition of terms given in Appendix A. Man-work units on important crops and livestock for Jefferson Davis County and for Mississippi are given in Appendix Table 1. Relationship between the size of the farm business, as measured by productive-man-work units, and the various measures of income and other business analysis factors for the 155 farms is given in Table 25.

The labor income, total receipts, operator's labor earnings and labor returns per man, which measure the average return to all farm workers per 12 months of labor, increased with each increase in the size of the farm business as measured in man-work units, Figure 3. The operator's labor income averaged $313 larger on the 57 farms with more than 335 man-work units per farm than on the 49 farms with less than 236 productive-man-

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[8] E. G. Misner, "Thirty Years of Farming in Tompkins County, New York," Cornell University Agri. Exp. Sta. Bulletin 782, June 1942.

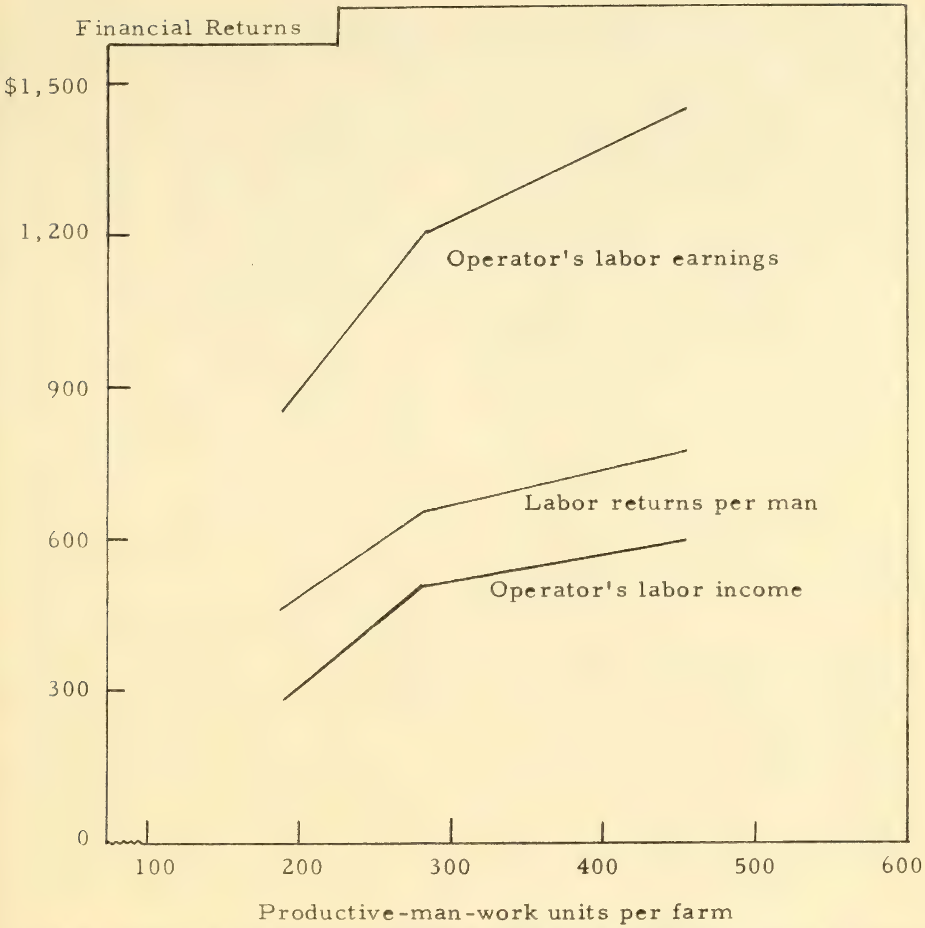

Figure 3. Relation of the productive-man-work units per farm to labor income and other measures of financial returns, 155 farms, Jefferson Davis County, Mississippi, 1950.

work units per farm. Total receipts averaged $1,722 more on the largest size group than on the smallest size farms.

As an average, the operator's labor income increased $1.18, the operator's labor earnings $2.24, and the labor returns per man $1.18 per additional work unit.

The farms of Veterans were mostly small to medium in size and tended to increase returns in the first two size groups due to the relatively large payments received by them from non-farm sources.

Other measures of the size of the farm business also showed a positive relationship with the productive-man-work units. The 49 farms with less than 236 man-work units had a man equivalent of 1.4 per farm and all other measures of size were correspondingly lower for those farms than for the larger businesses. These farms are commonly referred to as a one-man business. The labor force consisted of the farmer himself with a small amount of extra labor. Acres operated averaged 59 on which 20 acres of crops were grown including 5.7 acres of cotton. The capital averaged $3,916 per farm, Figure 4.

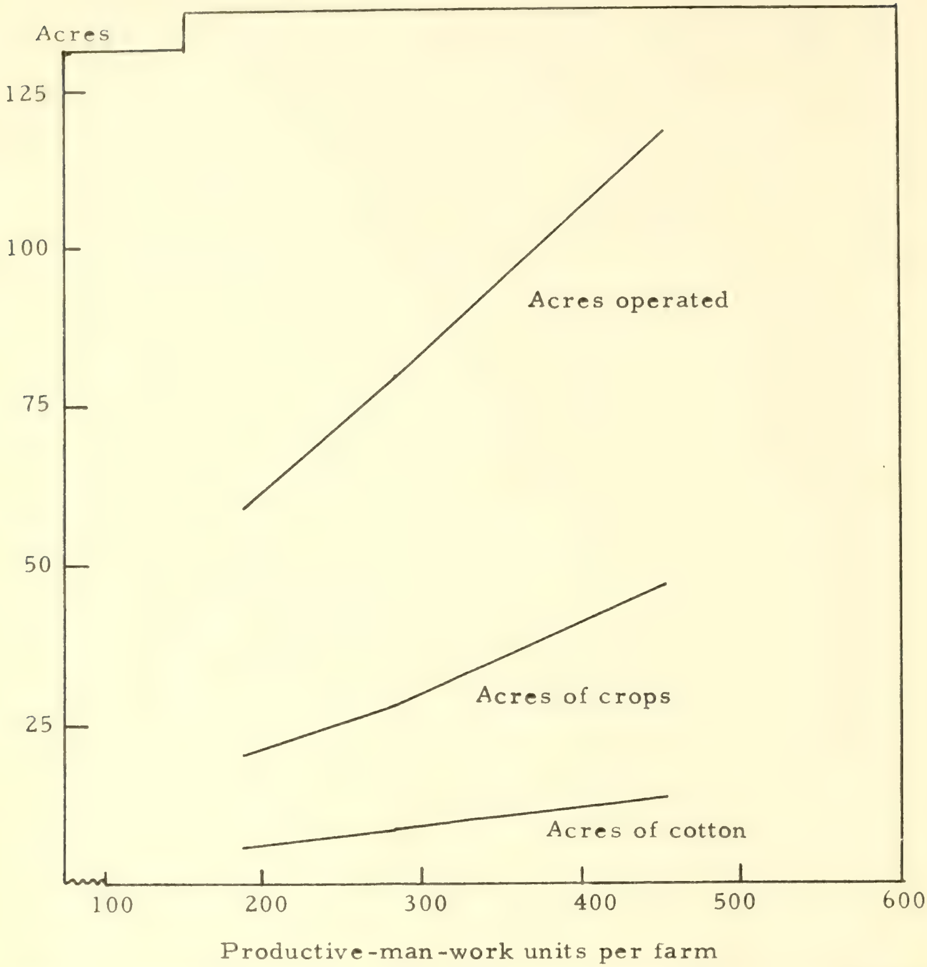

Figure 4. Relation of the productive-man-work units per farm to other measures of size of the farm business, 155 farms, Jefferson Davis County, Mississippi, 1950.

Capital increased $17 for each additional work unit represented by the businesses.

The 57 farms with more than 335 man-work units had a man equivalent of 1.8 so might be considered roughly as two-man farms. All other measures of size were correspondingly higher for these farms.

As indicated previously one of the greatest advantages of the larger businesses was that they used labor more efficiently than the smaller businesses. An average increase in the number of man-work units from 186 to 452 on the 155 farms studied was accompanied by an increase of 118 work units per man, 3.3 acres of cotton per man and 11.5 acres of crops per man. Stated another way, on the average 135 days of work per man (work units) were accomplished during the year for the 49 small businesses as compared with 253 days per man in the group of 57 large businesses.

In general, the larger businesses obtained lower rates of crop production than did the smaller businesses. This was a disadvantage to large business because with the low crop yields, the larger the business the larger may be the loss. An average increase from 186 man-work units to 452 was accompanied by an average decrease of 23 in the crop index and a decrease of 49 pounds of cotton per acre.

The type of business on farms studied changed somewhat as size increased. On the larger businesses with more than 335 man-work units a slightly smaller percentage of the total man-work units was used for cotton, and a much higher percentage of total receipts was derived from livestock than on those with less than 236 work units. The percentage of receipts from cotton was lowest for the group of farms that averaged 281 man-work units. However, there was practically no difference in the proportion of the crop acres in cotton for the large or small businesses.

Some additional factors relating to the size of the farm business as measured by the work units may be noted. The age of the farm operator varied only slightly between the large and small farms. The average age of the operators with less than 236 man-work units was 53 while that of the operators with more than 335 man-work units was 52.

Total expenses averaged $852 and total indebtedness averaged $94 per farm on small businesses while total expenses averaged $2,040 and total indebtedness averaged $205 per farm on large businesses, Figure 5. The proportion of farms having the highest debts tended to be the middle group. Debts increased an average of $0.79 per additional work unit.

Acres Operated: Another measure of the size of the farm business frequently used is the acres operated which includes both owned and rented land. When the farms were grouped on the basis of the acres operated per farm, the average varied from 39 acres in the smallest size group to 142 acres for the largest size group.

There were 46 farms with less than 50 acres operated per farm. The average labor income for this group was $356. The farms ranging in size from 50 to 80 acres operated made an average labor income of $463 and the group of farms with more than 80 acres operated made $566. In this latter group the average number of acres operated per farm was more than three and one-half times the average of the group of small farms. Total receipts, operator's labor earnings and labor returns per man also increased as the acres operated increased, Table 26.

Acreage operated was also positively related to labor efficiency. An increase from 39 acres to 142 acres per farm resulted in an increase of 58 acres operated per man and 80 productive-man-work units per man.

The group of farms with the largest acres operated also had more capital but did not have higher rates of crop production. The group of farms with between 50 and 80 acres operated had the highest rates of crop production (crop index).

Diversity of Business or Combination of Enterprises

The selection of enterprises and their combination into a well-balanced farm business are important factors affecting the year's income of a farmer. Certain crops and kinds of livestock contribute more to financial returns than do others. Changes in economic conditions and technology affect the relative advantage of various farm enterprises and a farmer must keep his organization adjusted to them.

Although the system of farming in Jefferson Davis County was predominantly cotton production, there was some variation in the relative emphasis on cotton and on other enterprises among the farms studied. Too few farms were included to study in detail the most profitable combination of enterprises, and other related problems, but it is possible to show the effects of associated differences in some of them.

The two measures of system and diversity of business or combination of enterprises used in this study were the percentage of cash receipts from crops,

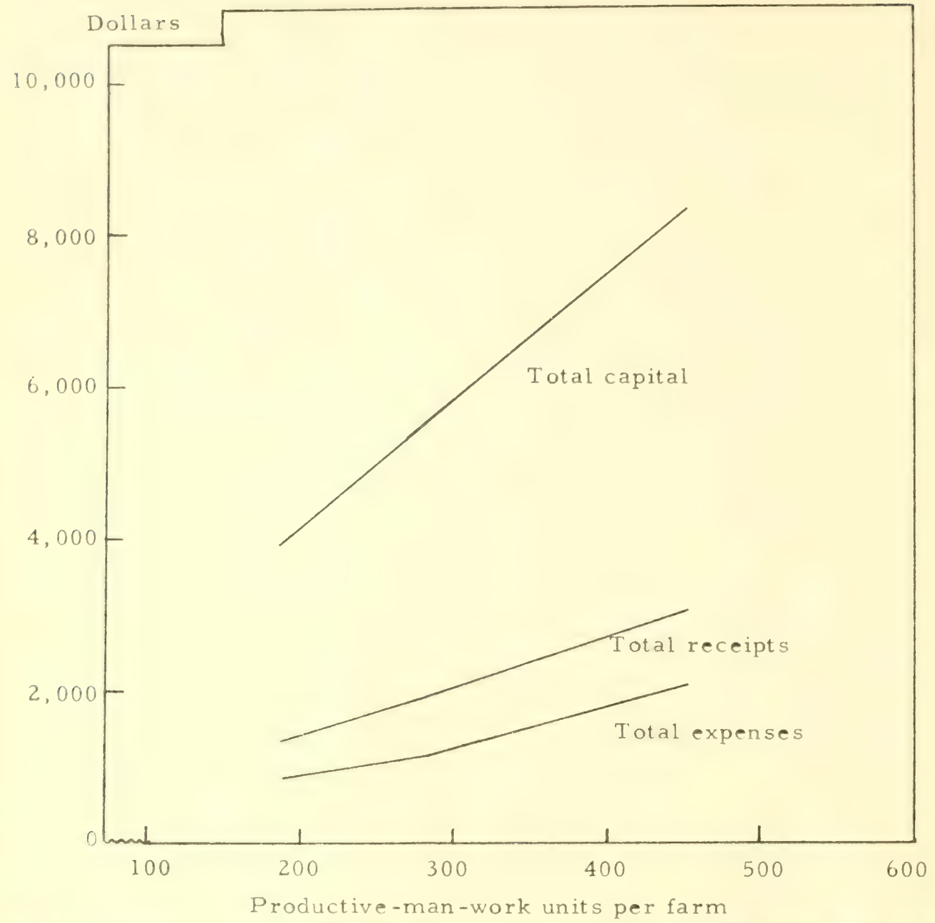

Figure 5. Relation of the productive-man-work units per farm to total capital and other factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Table 26. Relation of acres operated to returns and other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Acres operated: Less than 50	Acres operated: 50 to 80	Acres operated: More than 80
Farms studied	Number	155	46	52	57
Financial returns:					
Total receipts*	Dollars	2,154	1,419	2,197	2,791
Operator's labor income	Dollars	469	356	463	566
Operator's labor earnings	Dollars	1,184	966	1,153	1,389
Labor returns per man	Dollars	649	535	632	743
Size of business.					
Area operated	Acres	87	39	68	142
Man equivalent	Number	1.6	1.4	1.5	1.7
Total capital	Dollars	6,049	3,840	5,866	7,998
Production and labor efficiency:					
Crop yield index	Percent	122	119	135	112
Man-work-units per man	Number	201	159	192	239
Area operated per man	Acres	56	27	44	85

*Includes increases but not decreases in inventories.

and the percentage of productive-man-work units on cattle. The relationship of these factors to financial returns is presented here.

A general picture of the frequency and magnitude of the different enterprises found on these farms has been given in Table 16. All farms reported cotton sales; about three-fourths reported sales of cucumbers. About three-fourths reported sales of poultry or eggs or both. Two-thirds reported sales of lumber, logs or wood. Cattle sales, income from work off the farm and sales of swine were reported by the next largest number of farms. The farms with a combination of these important enterprises made the highest labor incomes. During the survey year, the results suggest that the addition of cattle to the cotton enterprise was a more profitable practice than specialization in crops.

Before concluding that the most profitable system and diversity of business or combination of enterprises for farms in this area over the years is one that provides crops and livestock, changes in the relative price advantage of various enterprises must be considered.

On October 15, 1950, the year covered by the survey, the average price of beef cattle in Mississippi was $19.30 per hundredweight. However, two years later in 1952, the average price of beef cattle was $16.60 per hundredweight, a decline of 14 percent from the survey year. The average price of cotton in Mississippi on October 15, 1950 was 38.9 cents per pound. During this same period in 1952, the price of cotton was 37.6 cents per pound, a decline of 3 percent. The extent by which the sales of beef cattle contributed to the financial returns in 1950 when cattle were relatively high in price may not be typical of an average year when cattle and cotton prices are in more nearly normal ratio to each other.

One aspect of the diversity of the farm business is the diversity or combination of the strictly farm enterprises. The other is the diversity, or sources of the income, such as that derived from farm enterprises and that from non-farm sources, which includes services performed for others or revenue from the government.

The number of sources of income is a misleading measure of diversity on the farms surveyed unless the farms of Veterans are omitted from the analysis. For example, the 20 farms of Veterans received an average of 33 percent of their cash receipts from crops and 28 percent from cotton and made higher labor incomes. In contrast, 60 percent of the cash receipts was from crops and 51 percent from cotton on the farms of non-Veterans with lower labor incomes, Appendix Table 2. These extreme variations in the proportion of cash receipts from crops and cotton were due to the fact that the Veterans were fortunate enough to receive an average of $1,188 miscellaneous non-farm income from Federal benefits. This payment reduced the proportion of the Veteran's income from the various farm enterprises. However, even when the farms of Veterans were excluded, too high a degree of cotton specialization was not profitable in 1950 on these farms.

Percentage of Cash Receipts from Crops: The proportion of the cash receipts which was obtained from crops is an indication of the balance of the business or intensity of crop enterprises. However, the results from this factor can be misleading as pointed out previously, because a large percentage of receipts from crops is to some extent the consequence of a large proportion of the receipts from cotton. This is contrary to the usual conception of the desirability of a large number of important sources of income; it is, in this region, a corollary to a high degree of specialization in cotton which was not as profitable in 1950 as a combination of enterprises with the emphasis on cotton and more on other sources of income.

The larger the proportion of the total cash receipts that was received from crops, the lower was the labor income, labor returns per man, cash receipts from livestock and miscellaneous non-farm income, Table 27.

An increased proportion of the cash receipts from crops was accompanied by more acres of cotton, but the total capital, work units per farm and accomplishments per man decreased, Table 27. Farms with 50 to 75 percent of the cash receipts from crops had the lowest rates of production.

Percentage of the Productive-Man-Work Units on Cattle: The group of farms with less than 10 percent of the productive-man-work units on cattle made the lowest labor income, Table 28. In 1950, to increase the proportion of the man-work units on cattle on the farms with less than 10 percent was profitable but to increase the proportion on farms with more than 14 percent of the man-work units on cattle was not profitable.

As the proportion of productive-man-work units on cattle increased the total productive-man-work units decreased while the proportion of productive-man-work units on corn and cotton remain about the same.

There was no significant change in the average number of work units accomplished per man as the proportion of the productive-man-work units on cattle increased, Table 28. The size of

Table 27. Relation of the percentage of cash receipts from crops to returns and to other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Percent of cash receipts from crops: Less than 50	50 to 75	More than 75
Farms studied	Number	155	50	52	53
Financial returns:					
Operator's labor income	Dollars	469	854	212	358
Labor returns per man	Dollars	649	895	494	578
Size of business:					
Productive-man-work units	Units	314	332	330	280
Area in cotton	Acres	9.1	8.0	9.3	10.1
Total capital	Dollars	6,049	6,475	6,435	5,268
Combination of enterprises or diversity:					
Proportion of cash receipts from—					
Crops	Percent	56	31	62	87
Cotton	Percent	47	25	51	78
Livestock*	Percent	12	19	9	5
Miscellaneous non-farm sources	Percent	22	40	14	2
Production and labor efficiency:					
Crop yield index	Percent	122	130	109	126
Man-work units per man	Number	201	218	210	178

*Does not include livestock products sold.

Table 28. Relation of the percentage of the productive-man-work units on cattle to returns and other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Percent of productive-man-work units on cattle: Less than 10	10 to 14	More than 14
Farms studied	Number	155	45	50	60
Financial returns:					
Operator's labor income	Dollars	469	361	513	514
Labor returns per man	Dollars	649	605	672	666
Size of business:					
Productive-man-work units	Units	314	330	319	297
Open pasture	Acres	6.4	4.1	5.5	8.9
Productive-man-work units on cattle	Units	43	19	38	64
Total capital	Dollars	6,049	5,309	6,052	6,601
Combination of enterprises or diversity:					
Proportion of productive-man-work units on—					
Cattle	Percent	14	6	12	22
Cotton	Percent	30	31	30	29
Corn	Percent	15	15	15	15
Production and labor efficiency:					
Crop yield index	Percent	122	112	116	134
Man work units per man	Number	201	199	201	199
Animal units, except work animals, per man	Number	3.4	1.7	3.1	4.9

the business as measured by the total capital and the rates of production (crop index) increased as the proportion of the man-work units on cattle increased. An increase of 1 percent in the work units on cattle was associated with an increase of $81 total capital and 1 percent in the crop index.

Rates of Production

Rates of production of both crops and livestock, which means yield per acre or per animal, affect the returns a farmer receives from his business. In general, farm management studies indicate that rates of production have a direct effect on the farmers' income.

Most of the time it pays to have high rates of production. The advantage obtained by having high rates of production is greater when prices are high than when they are low.

For any given set of conditions, if the price-cost relationship is favorable enough to enable the average producer to make a positive labor income, the greater the magnitude of the business, the greater will be the labor income. Magnitude or total volume of production is primarily due to size of the enterprise combined with good rates of production or yields. Some farmers have both, some only one of these, some neither.

Contrarily, when costs are so high relative to prices received that the average producer cannot make a reasonably good labor income, it is quite likely, but not necessarily true, that the producer with the greater magnitude of business will make the greater loss. Thus it is plain that the relationship of any business analysis factor to the operator's labor income depends to a great extent on the price-cost ratio.

Crop yields vary from year to year due to weather conditions, the fertilizer applied and the managment practices followed in production. There is little the farmer can do about the weather but he can follow the recommended methods of cultivation and fertilization practices to help obtain high yields.

Crop Index: The crop index used in this study is the yield of all important crops grown on the farm expressed as a percentage of the average for the Longleaf Pine Area in Mississippi for the period 1937-1941. Thus a crop index of 100 for a farm means that the level of crop yields on that farm was the same as the five-year average for the area. The average crop index of 122 means, therefore, that for the year studied yields of crops on these farms averaged 22 percent higher than average yields in the Longleaf Pine Area for 1937-1941.

Table 29. Relation of crop index to returns and other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Crop index		
			Less than 94	94 to 124	More than 124
Farms studied	Number	155	51	51	53
Financial returns:					
Total receipts*	Dollars	2,154	1,870	1,821	2,749
Operator's labor income	Dollars	469	147	359	885
Labor returns per man	Dollars	649	471	547	929
Size of business:					
Productive-man-work units	Number	314	334	302	306
Area operated	Acres	87	96	82	83
Area in cotton	Acres	9.1	9.8	9.0	8.7
Total capital	Dollars	6,049	5,744	5,439	6,929
Combination of enterprises or diversity:					
Purchased fertilizer per acre of cropland	Dollars	6.94	6.03	6.73	8.03
Production and labor efficiency:					
Crop yield index	Percent	122	76	109	178
Man-work units per man	Number	201	202	203	199
Area in cotton per man	Acres	5.9	5.9	6.1	5.6
Area operated per man	Acres	56	58	55	54

*Includes increases but not decreases in inventories.

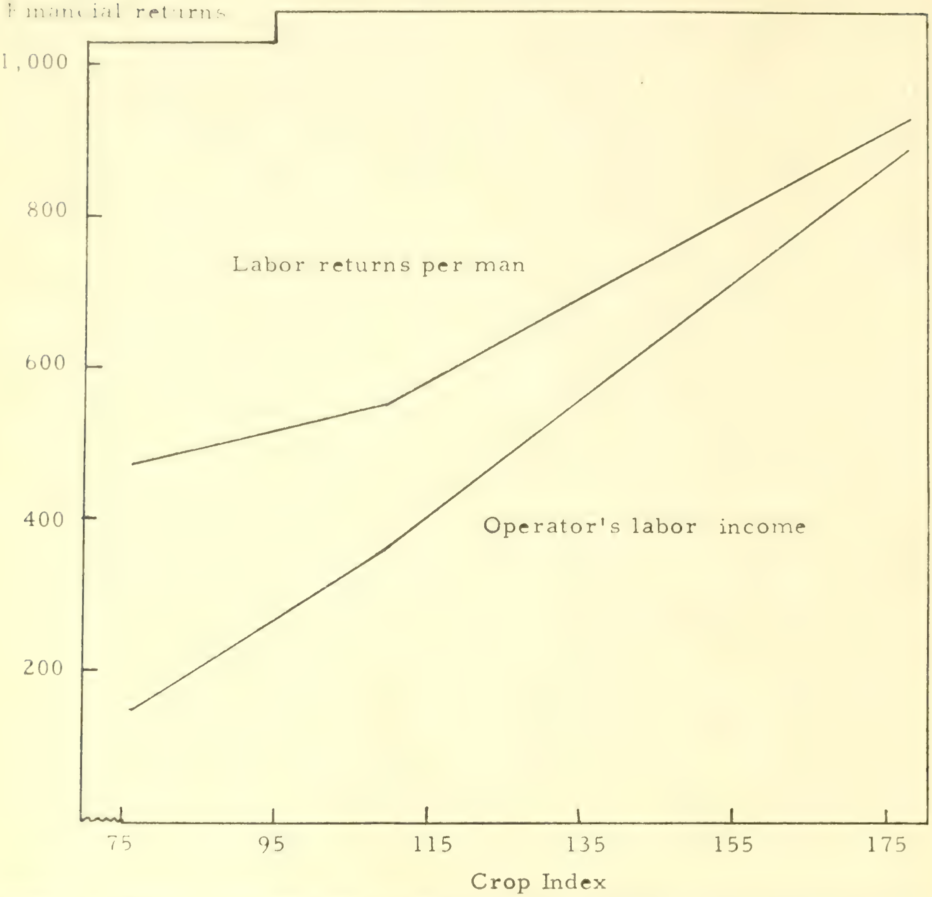

Figure 6. Relation of the crop index to financial returns, 155 farms, Jefferson Davis County, Mississippi, 1950.

While the important crops grown on the farms studied had a crop index of 122 percent of the five years, 1937-41, Longleaf Pine Area average yields, the comparable State yields of those crops in 1950 were 148 percent of the five-year average Longleaf Pine Area yields. Therefore, the crop yields on the farms studied in 1950 were only 82 percent of the State average yields.

The farms with a high crop index had a higher operator's labor income and higher labor returns per man than the farms with low crop indices, Table 29 and Figure 6. On farms with a low crop index, less than 94 percent, the average labor income was $147 and the labor returns were $471 per man, whereas with a high crop index, more than 124 percent, the average labor income was $885 and the labor returns were $929 per man. There was a joint relationship of crop yields with the proportion of the farms operated by Veterans. The relationship of returns for labor to crop index when all farms were included, therefore, was biased by the non-farm receipts of the greater proportion of Veteran-owned farms in the two groups with the higher crop yields.

Much of the unusually wide difference in incomes between the farms with a low crop index and those with a high crop index was attributed to better crop yields, because there was little variation in the average size of business (productive-man-work units and acres of cotton) and accomplishments per man (productive-man-work units per man) as the crop index increased.

As the crop yields increased from group to group of farms, the productive-man-work units per man, the acres of cotton per man and the acres operated per man remained constant while the purchased fertilizer per acre of cropland increased, Table 29.

Yield of Cotton Per Acre: The yield of cotton in pounds per acre was an important factor in determining the crop index. The yield of cotton on the farms surveyed consequently had a markedly favorable effect on operators' labor incomes and labor returns per man.

Including the farms of Veterans tended to increase operators' labor incomes and labor returns per man. Since a larger proportion of the Veterans had higher yields of cotton than the non-Veterans, more of their farms fell in the highest yield group.

The 53 farms with more than 259 pounds of cotton per acre, averaging 376 pounds, made an average labor income of $835 and labor returns per man of $892, in contrast to a labor income of $255 and to labor returns per man of $507 for the group of 50 farms with a yield of less than 180 pounds per acre, averaging 120 pounds of cotton per acre.

As the yield of cotton increased the average productive-man-work units did not vary much among the different groups of farms, whereas the acres operated and acres of cotton declined.

As the yield of cotton increased the productive-man-work units per man and the acres of cotton per man remained about the same among groups but as expected the total receipts and purchased fertilizer per acre of cropland increased, Table 30.

Labor Efficiency

Labor efficiency is a measure of how effectively the total family and hired labor on the farm is used. The number of days of productive work accomplished per man is probably the most accurate measure of labor efficiency because it indicates the accomplishment per worker more accurately than does the acreage of crops. However, the acres of cotton per man is a good measure, also and more easily determined.

Productive-Man-Work Units Per Man: On the farms surveyed, 49 had fewer than 166 work units per man averaging 132, while 50 had more than 215, averaging 283 per man, Table 31.

Table 30. Relation of yield of cotton in pounds per acre to returns and other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Units	All farms	Yield of cotton per acre, pounds: Less than 180	180 to 259	More than 259
Farms studied	Number	155	50	52	53
Financial returns:					
Total receipts*	Dollars	2,154	1,912	1,864	2,668
Operator's labor income	Dollars	469	255	302	835
Labor returns per man	Dollars	649	507	527	892
Size of business:					
Productive-man-work units	Units	314	326	308	308
Area operated	Acres	87	99	86	76
Area in cotton	Acres	9.1	9.7	9.4	8.4
Total capital	Dollars	6,049	5,822	5,929	6,381
Combination of enterprises or diversity.					
Purchased fertilizer per acre of cropland	Dollars	6.94	5.89	7.18	7.70
Production and labor efficiency:					
Yield of cotton per acre	Pounds	241	120	219	376
Man-work-units per man	Number	201	211	203	192
Area in cotton per man	Acres	5.9	6.3	6.2	5.2
Area operated per man	Acres	56	64	57	47

*Includes increases but not decreases in inventories.

Table 31. Relation of productive-man-work units per man to returns and to other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Productive-man-work unit per man		
			Less than 166	166 to 215	More than 215
Farms studied	Number	155	49	56	50
Financial returns:					
Operator's labor income	Dollars	469	227	448	729
Labor returns per man	Dollars	649	458	639	843
Size of business:					
Productive-man-work units	Units	314	199	300	441
Man equivalent	Number	1.6	1.5	1.6	1.6
Area operated	Acres	87	62	76	123
Area in crops	Acres	33	21	32	46
Area in cotton	Acres	9.1	6.1	9.1	12.3
Total capital	Dollars	6,049	4,259	5,575	8,333
Production and labor efficiency:					
Crop yield index	Percent	122	135	117	114
Man-work units per man	Units	201	132	188	283

As the labor efficiency increased the operator's labor income and the labor returns per man increased consistently, Figure 7. For the group of farms with the least efficient use of labor, measured by work units per man, the average labor income was $227; the labor returns per man averaged $458. For the most efficient farms, the average operator's labor income was $729 and the labor returns per man were $843. Part of this difference in income may be attributed to the influences of the non-farm incomes on farms of Veterans and to the sharp increase in the size of business which accompanied the increase in the number of man-work units per man. Size and accomplishment per man are jointly related. How much is due to the extra size and how much to the increased efficiency is always difficult to determine; size permits efficiency of operation.

The farms with the greater labor efficiency generally averaged lower in rates of production (crop index) than the other farms, Table 30. The acres of crops per farm and total capital investment were greater on the farms that were more effiicent in the use of labor. But it is more difficult to obtain high yields with a large business than with a small one. Those who can are more successful than those who cannot do so.

The Efficient Use of Capital

Efficiency in the use of farm capital represented by the farm business was another factor that affected the financial returns of the farmers. The measure of capital efficiency used for this study was the farm capital turnover, or the time required for the receipts to equal the capital. A high ratio of receipts to capital must result in higher returns for labor as the interest charge on capital then takes a smaller share of the receipts thus leaving labor a larger share.

The higher the capital-receipts ratio, that is, the more years that would be required for receipts to equal the capital, the less efficient was the use of the capital. In this area not more than one and one-half to two years should be required for the receipts to equal the capital investment.

The farms with a capital turnover of less than 2.5 had a labor income of $1,025 and a labor return per man of $1,008. The farms with a capital-receipts ratio of more than 3.6 had a negative labor income of $32 and a positive labor return per man of $311, Table 32. The non-farm income of 13 Veterans in the first group and the 6 Veterans in the second group increased the returns in these groupings. The relationship of the capital - receipts ratio was, therefore, more significantly indicated when the farms of Veterans were excluded from the groups. Nevertheless, when the farms of Veterans were excluded for the analysis, the operators who were more efficient in the use of capital still were more successful than those who had

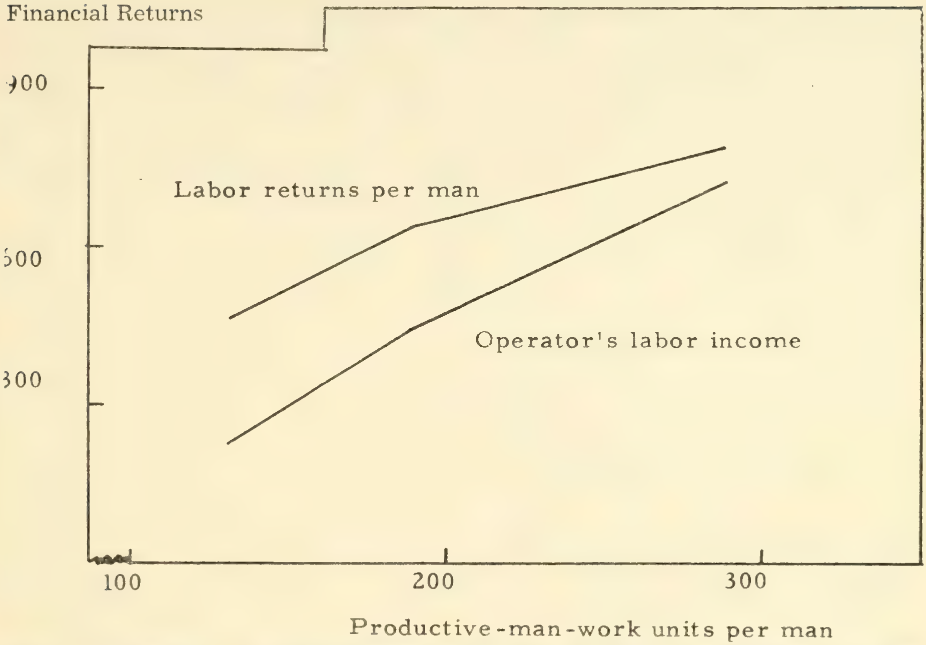

Figure 7. Relation of the productive-man-work units per man to labor income and other financial returns, 155 farms, Jefferson Davis County, Mississippi, 1950.

more capital relative to receipts.

A low capital-receipts ratio was obtained by a large business in proportion to the total capital and high rates of production, Table 32. The combination of these factors increased the receipts relative to the total capital.

Combination of Important Factors On Non-Veteran Farms[9]

Five important analysis factors that were found to be related in a positive manner to financial returns in Jefferson Davis County were (1) the productive-man-work units per farm, (2) percentage of the crop acres in cotton, (3) crop index, (4) productive-man-work units per man, and (5) miscellaneous non-farm receipts.

It has been shown previously that it paid well to be above the average of the group in some of these factors. In general, extreme specialization in crops was not as profitable in 1950 as a combination of income from crops, livestock, forest products and work off the farm. Nevertheless, specialization in crops was profitable for the 17 farmers who were average or above in productive-man-work units, crop index and productive-man-work units per man, Table 33. The combined effect of the five factors on incomes may be shown by contrasting the results on farms that were below average with those that were average or above.

The farms that were below average in all five factors had an average labor income of minus $21; those that were above in only one factor had an average income of $128; those that were above in two factors averaged $156; those above in three factors, $540; those above in four factors, $1,066; while those that were average or better in five factors averaged $1,844 operator's labor income. Only two of the 135 non-Veteran farms were in the last group.

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[9] Veterans were excluded because of their high "miscellaneous non-farm receipts," which became a sort factor in this analysis.

Table 32. Relation of farm capital turnover (years required for receipts to equal capital) to returns and to other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Farm capital turnover: Less than 2.5	2.5 to 3.6	More than 3.6
Farms studied	Number	155	51	53	51
Financial returns:					
Total receipts*	Dollars	2,154	3,168	1,937	1,367
Operator's labor income	Dollars	469	1,025	417	—32
Labor returns per man	Dollars	649	1,008	617	311
Size of business:					
Productive-man-work units	Units	314	336	314	291
Area operated	Acres	87	79	78	103
Area in cotton	Acres	9.1	9.7	9.1	8.7
Total capital	Dollars	6,049	5,519	5,739	6,901
Capital in real estate	Dollars	4,253	3,586	4,031	5,151
Production, labor and capital efficiency:					
Capital turnover	Years	2.8	1.7	3.0	5.0
Crop yield index	Percent	122	135	119	111
Man-work units per man	Units	201	210	205	189

*Includes increases but not decreases in inventories.

Table 33. Relation of number of factors average or better to labor income, 135 farms,* Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Farms average or better in specified number of factor: None	One	Two	Three	Four	Five
Farms studied	Number	135	12	40	36	28	17	2
Productive-man-work units	Percent	322	205	229	303	424	457	688
Proportion of crop area in cotton	Percent	29	23	29	30	30	34	40
Crop index	Percent	114	86	109	118	103	150	138
Productive-man-work units per man	Number	204	138	156	197	262	261	344
Miscellaneous non-farm receipts	Dollars	273	21	125	161	396	712	1,288
Total receipts**	Dollars	2,059	985	1,325	1,635	2,810	3,698	6,400
Total capital	Dollars	6,115	4,479	4,282	5,603	8,383	8,303	11,454
Labor income	Dollars	351	—21	128	156	540	1,066	1,844

*Excludes farms of Veterans.

**Includes increases but not decreases in inventories.

A farm with more than 322 productive-man-work units, a crop index of more than 114, and productive-man-work units per man of more than 203 (simple average) were the basic requirements for a successful farm business in 1950. The effects of various factors on the labor income are shown in Table 34. The 22 farms that were below average in productive-man-work units, crop index and percentage of the crop acreage in cotton had an average labor income of $186. In contrast the 11 farms that were average or more in these factors had an income of $1,440.

The farmers who had small farm businesses and low crop yields made better incomes when they had a relatively large percentage of the crop acreage in cotton. When the farm business was small and the crop yields were high, the farmers with a small percentage of their crop acreage in cotton made about the same labor income as the farmers with a large percentage of their crop acreage in cotton. On the large farm businesses with low crop yields, the farmers with a small percentage of their crop acreage in cotton made about the same income as the farmers with a large percentage in cotton. But with the large farm businesses and high crop yields a large percentage of the crop acreage in cotton resulted in a decidedly higher labor income than a small percentage in cotton.

Miscellaneous Factors

Age of Operator: The average age of the operators included in this study

Table 34. Effect of combination of size (productive-man-work units), crop yields (crop index) and diversity (percentage of crop acreage in cotton) on labor income, 135 non-Veteran farms, Jefferson Davis County, Mississippi, 1950.

Item	Total productive-man-work units			
	Below average		Average or more	
	Crop index			
	Below average	Average or more	Below average	Average or more
Percentage of crop acreage in cotton:				
Average or more:				
Number of farms	23	12	15	11
Total productive-man-work units	231	217	419	454
Crop index	89	161	91	154
Percentage of crop acreage in cotton	39	38	36	37
Productive-man-work units per man	161	153	245	244
Labor income	$55	$297	$336	$1,440
Below average:				
Number of farms	22	19	21	12
Total productive-man-work units	228	223	452	463
Crop index	86	154	81	148
Percentage of crop acreage in cotton	24	22	23	23
Productive-man-work units per man	163	156	272	273
Labor income	$186	$251	$328	$494

was 51 years, ranging from 24 to 80 years. Thirty-six percent of the operators were less than 45 years old and 31 percent were 60 years old or older, Table 35.

The most successful operators were those less than 45 years old, Table 36. The average labor income and operator's labor earnings decreased as the average age increased. However, the Veterans had considerable influence on the income of the younger men. All of the Veterans were relatively young and placed in the first group.

There was no significant difference in the education of the younger and older operators. The younger men, including the Veterans, used labor more efficiently and obtained higher rates of production (crop index) as compared to the older men, Table 36. However, the younger men just starting out had less farm capital and somewhat higher debts than the older men.

Education: The number and the proportion of farm operators having different amounts of education are shown in Table 37. In 1950, 17, or 11 percent, of the farmers had completed less than three grades of schooling while 25, or 16 percent, had completed more than eight grades. Six farmers reported no formal education and two attended college.

While some of the farmers did not have a formal education, they showed intelligence and managerial ability in operating their farms. A few were self educated, and many had wives or other relatives within their household with a better education than themselves.

The financial returns and other factors of the farm operators with various amounts of education are given in Table 38. The most successful operators were those with the most education. The farmers who finished less than six grades, averaging three, had a labor income of $284, while those who finished more than eight grades, averaging eleven, had a labor income of $601 which was $317 per farm more than the first group. The labor income and labor returns per man of the Veterans exceeded that of any group largely because of the Federal payments.

Although the additional education, of itself, was not the direct cause of an increased income, the results suggest that education in farming is important. The handicap which the untrained farmer must overcome is constantly increasing.

Table 35. Variation in the age of the operators, 155 farms, Jefferson Davis County, Mississippi, 1950.

Age	Operators	Proportion of operators	Cumulative proportion of operators
Years	Number	Percent	Percent
20-24	1	0.7	0.7
25-29	7	4.5	5.2
30-34	10	6.5	11.7
35-39	12	7.7	19.4
40-44	25	16.1	35.5
45-49	16	10.3	45.8
50-54	20	12.9	58.7
55-59	16	10.3	69.0
60-64	12	7.7	76.7
65-69	17	11.0	87.7
70-74	13	8.4	96.1
75-79	5	3.2	99.3
80-84	1	0.7	100.0
Total	155	100.0	

Table 36. Relation of the age of the operator to returns and to other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Age of operator, years: Less than 45	45 to 59	More than 59
Farms studied	Number	155	55	52	48
Financial returns:					
Operator's labor income	Dollars	469	823	398	141
Operator's labor earnings	Dollars	1,184	1,575	1,133	793
Size of business:					
Productive-man-work units	Units	314	316	339	284
Area operated	Acres	87	73	86	103
Area in cotton	Acres	9.1	8.6	10.3	8.5
Total farm capital	Dollars	6,049	5,748	6,380	6,036
Production and labor efficiency:					
Crop yield index	Percent	122	139	117	107
Man-work units per man	Units	201	207	208	187
Area in cotton per man	Acres	5.9	5.6	6.3	5.6
Miscellaneous:					
Age of farm operator	Years	51	37	52	68
Education completed	Grades	6	7*	6	5
Total indebtedness	Dollars	250	318	261	159
Net worth (personal)	Dollars	7,131	7,066	7,406	6,907

*Includes Veterans who received technical training in addition to school grades completed.

Some of the differences in incomes of the various educational groups are due to the increased size of business as measured by productive-man-work units, acres of cotton, and capital, and to higher labor efficiency (productive-man-work units per man and acres of cotton per man); and to higher rates of production or crop index, Table 38.

The value the operators placed on their labor increased consistently as the education acquired increased. The age of the operator, farm experience, price received for cotton and distance to market did not vary significantly among the groups.

SUCCESSFUL FARMS

A brief description of a few of the successful farms will serve to illustrate the influence of good farm organization on financial returns in Jefferson Davis County.

A Specialized Cotton Farm

The labor income on this farm, which has been owned and operated by the present farmer for 33 years, was $2,609, or more than five times the average for the farms studied, Table 39. The total receipts were $4,617 or more than two times the average of the survey. The average capital was $4,478, of which $1,303 was capital other than real estate.

The farm consisted of 165 acres of which 22 were planted in cotton. The work was done by the operator and about 11 months of family labor. The farmer valued his own time at $1,040 per year. The operator dusted his cotton four times, planted winter peas as a cover crop, applied 400 pounds of 6-8-8 fertilizer per acre of cotton and used D.P.L. No. 11 treated cotton seed. The crop yields per acre in 1950 were as follows: corn for grain, 32 bushels; cotton, 432 pounds; White Dutch clover hay, 1 ton; sugar cane syrup, 165 gallons; and sweet potatoes, 152 bushels.

The success of this farm business was due to the combination of very good yields and a high labor efficiency on a large business.

A Well-Diversified Farm Operated by a Non-Veteran

The labor income of this well-diversified farm operated by a non-Veteran

Table 37. Variation in education of farm operators, 155 farms,* Jefferson Davis County, Mississippi, 1950.

Grades completed	Operators	Proportion of operators	Cumulative proportion of operators
	Number	Percent	Percent
Less than 3	17	11.0	11.0
3 - 5	43	27.7	38.7
6 - 8	70	45.2	83.9
More than 8	25	16.1	100.0
Total	155	100.0	

*Includes 20 Veterans who received technical training in addition to the school grades completed.

Table 38. Relation of education of operator to returns and to other business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Education of operator, grades			
			Less than 6	6 to 8	More than 8	Technical, Veterans
Farms studied	Number	155	59	59	17	20
Financial returns:						
Operator's labor income	Dollars	469	284	347	601	1,266
Labor returns per man	Dollars	649	512	592	767	1,174
Size of business:						
Productive-man-work units	Units	314	288	336	394	256
Area in cotton	Acres	9.1	8.3	10.2	11.8	6.1
Farm capital—total	Dollars	6,049	5,424	6,339	7,734	5,603
—in real estate	Dollars	4,253	3,782	4,593	5,075	3,939
Production and labor efficiency:						
Crop yield index	Percent	122	108	113	135	176
Yield of cotton per acre	Pounds	241	223	247	233	283
Man-work units per man	Units	201	192	203	243	185
Area in cotton per man	Acres	5.9	5.6	6.2	7.3	4.4
Miscellaneous:						
Education of operator	Grade	6	3	7	11	8
Age of operator	Years	51	57	52	52	32
Farm experience	Years	31	35	32	33	15
Value of operator's labor	Dollars	1,346	1,244	1,327	1,497	1,577
Price of cotton per pound	Cents	38	38	38	38	38
Distance to market	Miles	7	7	8	6	6

was $2,267, or almost five times the average for the survey, Table 39. Farm receipts were $3,754. The average capital was $8,098.

The farm comprised 80 acres with 63 acres of crops, including 17 acres of cotton. There was also a herd of 20 dairy cattle. The labor force on this farm consisted of the farmer, his wife and his 19-year old daughter. Work units per man on this farm were well above the average of the survey. This operator dusted his cotton four times, planted hairy vetch as a winter cover crop, applied 400 pounds of 6-8-8 fertilizer per acre and used home-gorwn seeds not treated. The yields per acre were: corn, 17 bushels; cotton, 353 pounds; sugar cane syrup, 140 gallons; sweet potatoes, 70 bushels; and peanuts, 20 bushels.

The highly satisfactory profits from this business were the results of very good labor efficiency, a large size business and moderate crop yields.

A Well-Diversified Farm Operated by a Veteran

The operator had nine years of farm experience. He was a hired man away from home six years and owned and operated this farm three years. Ownership was made possible through benefits received from the Federal government, money saved while in the armed services and as a hired man.

The labor income of this business was $1,488, Table 39. The total receipts were $3,565 and the average capital was $10,006 in 1950.

The farm consisted of 100 acres with 34 acres of crops, including nine acres of cotton. There were 14 dairy cattle. The labor force of this farm consisted of the operator and about three months of family labor. The work units per man were about one-third higher than the average for the survey. The operator used 500 pounds of 6-8-8 fertilizer per acre of cotton, side dressed with nitrate of soda and used treated cottonseed. The yields per acre were: Cotton, 333 pounds; corn, 40 bushels; Alyce clover hay, ½ ton; sweet potatoes, 70 bushels; and peanuts, 28 bushels.

The outstanding features of this business were its large size, high crop yields, good labor efficiency and diversity of enterprises.

There were other well organized successful farm businesses in the area. One was owned and operated by a dealer in cattle and hay and several others by truckers.

Table 39. A comparison of three successful farms with all farms in returns and other business analysis factors, Jefferson Davis County, Mississippi, 1950.

Item	Unit	All farms	Selected successful farms		
			Specialized cotton	Well diversified farm of a	
				Non-Veteran	Veteran
Financial returns:					
Operator's labor income	Dollars	469	2,609	2,267	1,488
Operator's labor earnings	Dollars	1,184	3,638	2,923	2,179
Labor returns (all labor)	Dollars	1,011	3,659	2,642	1,834
Labor returns per man	Dollars	649	1,926	1,887	1,411
Return on capital above value of operator's time	Dollars	—574	1,793	1,232	490
Percent return in capital	Percent	—9.5	40.0	15.2	4.9
Size of business:					
Productive-man-work units	Units	314	440	518	403
Man equivalent	Number	1.6	1.9	1.4	1.3
Animal units, including work animals	Number	7.5	5.3	18.4	13.9
Animal units, excluding work animals	Number	5.2	3.3	15.4	12.4
Average capital (thousands)	Dollars	6.0	4.5	8.1	10.0
Area operated	Acres	87	165	80	100
Area in crops (double crops included)	Acres	32	55	63	34
Area in cotton	Acres	9.1	22.0	17	9
Number of dairy and beef cattle	Number	5	2	20	14
Total receipts[1]	Dollars	2,154	4,617	3,754	3,565
Type of business:					
Average miles to cotton market	Miles	7	11	4	10
Total productive-man-work units on:					
Cotton	Units	94	227	175	93
Corn	Units	47	80	96	38
Cattle	Units	43	16	145	153
Total productive-man-work units per acre of crops (double crops included)	Units	9.7	8.0	8.2	11.9
Combination of enterprises or diversity:					
Important sources of income—					
Crop receipts	Dollars	1,021	4,202	2,794	1,322
Cotton receipts	Dollars	871	4,136	2,659	1,322
Livestock receipts	Dollars	221	2	410	869
Miscellaneous receipts	Dollars	567	200	0	1,350
Proportion of crop acreage in—					
Cotton	Percent	28	40	27	26
Corn	Percent	46	45	48	35
Crop acres per animal unit, including work animals	Acres	4.3	10.4	3.4	2.4
Purchased fertilizer per acre of cropland	Dollars	6.94	6.98	4.06	10.03
Rates of production:					
Crop yield index[2]	Percent	122	190	121	157
Pounds of cotton produced per acre	Pounds	241	432	353	333
Bushels of corn produced per acre	Bushels	22	32	17	40
Labor efficiency:					
Productive-man-work units per man	Units	201	232	370	310
Areas of crops per man	Acres	20.9	29.0	44.7	26.2
Animal units, except work animals, per man	Number	3.4	1.7	11.0	9.5
Areas of crops per work animal	Acres	14.6	27.5	20.9	22.7
Labor returns per man-work unit	Dollars	3.22	8.32	5.10	4.55
Pounds of cotton produced per man	Pounds	1,367	5,000	4,286	2,308
Capital efficiency:					
Capital turnover[3]	Years	2.8	1.0	2.2	2.8
Capital in real estate	Dollars	4,253	3,175	5,100	6,550
Capital other than real estate	Dollars	1,796	1,303	2,998	3,456
Value of machinery and equipment per $100 receipts	Dollars	26.82	4.61	8.58	21.71
Capital-expense ratio	-	4.4	2.5	7.5	6.3
Expenses per $100 of receipts	Dollars	64	39	29	44
Capital per $100 of receipts	Dollars	281	97	216	281
Miscellaneous:					
Value of operator's time	Dollars	1,346	1,040	1,440	1,498
Total expenses[4]	Dollars	1 383	1,784	1,082	1,577
Price received per pound of cotton	Cents	38	40	40	40

[1] Includes increases but not decreases in inventories.

[2] Average for the Longleaf Pine Area = 100.

[3] Years required for receipts to equal farm capital.

[4] Includes decreases but not increases in inventories.

MANAGEMENT PRACTICES

Differences in some of the management practices on the farms surveyed were associated with variations in crop yields and production efficiency.

Insect Control for Cotton

Forty percent of the farmers interviewed applied no poison to their cotton in 1950 and two-thirds made less than three applications, Table 40. In general, the farmers who dusted the most times obtained the highest yields of cotton. The 62 farmers who applied no poison to cotton produced 188 pounds of cotton per acre, while those who poisoned five times produced 338 pounds per acre. During a normal year, six to seven dustings of poison should be applied to cotton. However, during periods of heavy infestation or frequent rainfalls more may be needed.

Cover Crops

Austrian winter peas and common vetch were the most common cover crops used. The importance of a cover crop is shown in Table 41. Seventy-three percent of the farmers surveyed planted no cover crop and produced 226 pounds of cotton per acre while 27 percent planted a cover crop and produced 280 pounds of cotton per acre. The farmers who planted cover crops generally had larger acreages of cotton than the farmers with no cover crops. Mississippi Experiment Station recommends planting from 25 to 50 percent of the cotton land each year to an adapted variety of winter legumes (vetch, clover or wild winter peas).

Fertilization of Cotton

Although most of the farmers surveyed applied some type of commercial fertilizer on cotton, the application per acre on most farms was considerably below recommended rates, Table 42. Seventy-three percent of the farmers applied 524 pounds or less of fertilizer per acre. Mississippi Experiment Station recommends 600 pounds of 5-10-5 or 6-8-8 mixed fertilizer per acre, side-dressed with 30 to 50 pounds of nitrogen in the hill sections. An increase of 100 pounds of fertilizer per acre of cotton on the farms surveyed was accompanied by an increased yield of 13 pounds of cotton per acre.

Other Practices

One hundred and fifty-one of the farmers surveyed planted cotton on ridges, and four used no ridges.

The area surveyed was fast becoming a one-variety community. The number of farmers planting different

Table 40. Relation of insect control practices on cotton to yield of cotton, 155 farms, Jefferson Davis County, Mississippi, 1950.

Times dusted	Farms	Proportion of farms	Area of cotton	Yield of cotton per acre
Number	Number	Percent	Acres	Pounds
0	62	40	8.8	188
1	20	13	8.7	216
2	22	14	10.0	287
3	24	15	7.7	268
4	19	12	10.8	319
5	7	5	11.8	338
7*	1	1	—	—
Total or average	155	100	9.1	241

*The results of this group are not significant since it included only one farm.

Table 41. Distribution of farms growing cover crops and yield of cotton per acre, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Farms	Proportion of farms	Area of cotton	Fertilizer used per acre of cotton	Yield of cotton per acre
	Number	Percent	Acres	Pounds	Pounds
No winter cover crop	113	73	8.8	437	226
Winter cover crop	42	27	10.0	424	280
Total or average	155	100	9.1	433	241

Table 42. Relation of the fertilization of cotton to the acreage and yield, 155 farms, Jefferson Davis County, Mississippi, 1950.

Fertilizer used on cotton					
Range	Average	Farms	Proportion of farms	Area of cotton	Yield of cotton per acre
Pounds	Pounds	Number	Percent	Acres	Pounds
Less than 325	236	40	26	9.5	217
325 - 424	387	38	24	9.7	233
425 - 524	476	35	23	9.4	240
More than 524	662	42	27	8.0	272
Total or average	433	155	100	9.1	241

varieties was as follows: Deltapine, 143; Bobshaw, 3; Stoneville, 1; and 9 did not know the variety planted. Deltapine and Stoneville varieties are recommended for the hill sections by the Mississippi Agricultural Experiment Station.

Thirty-three of the farmers indicated that they had a crop rotation while 122 had no rotation.

All of the farmers surveyed picked their cotton by hand.

STANDARD OF LIVING

The size of the families included in this study varied from one to 12 persons. While 28 percent of the farms had more than five members per family, only 24 percent had more than six rooms per family.

The conveniences of the farm families studied are listed in Table 43. The percent of the families reporting various conveniences were as follows: Electric lights, 66; radio, 95; daily newspapers, 19; farm magazines, 82; ordinary life insurance on the family head, 13; automobile, 29; and home screened, 49.

SUMMARY

The study was undertaken with several objectives: (a) To find what factors contributed to profitable farming in Jefferson Davis County; (b) to see which of these factors were most important; (c) to study the relationship between the factors that affect labor income; and (d) to establish patterns that determine adjustments in the organization of the farms so that trends over a period of years may be determined later.

Information for this study was obtained from 155 Negro owner-operators in Jefferson Davis County located in the southern part of Mississippi. The survey was for the year 1950 and included 135 farms operated by non-Veterans and 20 farms operated by Veterans.

The topography of the area is gently rolling to hilly; the soils are light-colored sandy loams with reddish friable subsoils. The land in farms in the County totaled 216,354 acres, or 81.7 percent of the approximate land area of 264,960 acres. About one-half of the soil on the farms was classified as Ruston fine sandy loam. The climate is temperate and humid; the average annual precipitation averages about 55 inches; and the growing season is approximately 242 days.

The crop year 1950 was a poor one and resulted in lower than normal yields for Jefferson Davis County. However, the average price received for cotton by the farmers in the area

Table 43. Home and family conveniences, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Number of families reporting	Percent of families reporting
Home:		
Lights:		
Electric	103	66
Oil lamp	52	34
Radio	147	95
Newspapers:		
Daily	29	19
Weekly	9	6
Farm magazines	127	82
Insurance:		
Ordinary life on:		
Family head	20	13
Wife	14	9
Children	9	6
Burial	131	85
Sick and accident	2	1
Hospitalization	1	1
Family conveniences:		
Automobile	45	29
Water supply*:		
Pump	29	19
Well	113	73
Cistern	1	1
Spring	14	9
Running water	1	1
None	2	1
Home screened	76	49

*Some farms reported more than one source of water was a slightly more favorable factor affecting farming returns in 1950 than at any other time in the past thirty years.

The cotton system of farming predominates in Jefferson Davis County. It is a system in which cotton production is planned as the major source of cash income. Corn was the next most important intertilled crop grown. The largest acreages of hay were lespedeza and mixed hay and the leading temporary grazing crop was oats.

Most of the farms were family operated, and the acres cultivated were insufficient to keep the operator fully employed. The average size of farms included in this survey was 86.7 acres, of which 31.0 were in crops, 33.1 in woods, 13.5 idle, 6.4 open pasture, 1.6 farmstead and roads, and 1.1 acres of waste land.

The average capital per farm was $6,049 of which $4,253 was in real estate, $933 in livestock, $578 in machinery and equipment and $285 in feed and supplies. Receipts amounted to $2,113 per farm of which approximately one-third or $777 per farm came from the sale of lint cotton, while an additional $94 or 4 percent came from the sale of cottonseed. Receipts from the sale of livestock and livestock products was the next most important cash enterprise and amounted to $249 per farm or 12 percent of the total income. The sale of forest products averaged $108 per farm or 5 percent of the total receipts. Approximately 40 percent of the farmers reported an average income of $143 per farm from man-work off the farm. The total expenses, excluding the interest charge on capital used and any charges for the farmer's time, averaged $1,341 per farm of which $835 was cash and $506 was non-cash items. The operator's labor income averaged $469 per farm. In addition to this labor income of $39 per month, the farmer had the use of a house and products from the farm for family living valued at $715 per farm.

The size of business, combination of enterprises, rates of production, labor efficiency and capital efficiency were the principal factors affecting incomes on the farms studied. Because of the favorable price conditions, a large size farm business was usually profitable in 1950. As the productive-man-work units and the acres operated increased, the operator's labor income and labor returns per man increased. Specialization in cotton was not as profitable as a combination of enterprises with less emphasis on cotton and more on other sources of income in 1950. As the crop index increased, the operator's labor income and the labor returns per man increased. An increase of one point, or 1 percent of the average of the area, in the crop index was accompanied by an increase of $6 per operator in the labor income and of $4 per man in the labor returns.

As the labor efficiency increased the operator's labor income and labor returns per man increased consistently. An increase of one in the productive-man-work units per man was accompanied by an increase of $4 in the labor income. As the efficiency in the use of capital increased, the labor income also increased.

The farms that were below average in man-work units per farm, percent of the crop acres in cotton, crop index, man-work units per man, and miscellaneous non-farm receipts had an average labor income of minus $21; while those that were average or better in the five factors averaged $1,844 operator's labor income. A farm with more than 322 productive-man-work units, a crop index of more than 114, and productive-man-work units of more than 203 per man were the basic requirements for a successful farm business in 1950 in the area studied. The farmers who had small farm businesses and low crop yields made better incomes when they had a relatively large percentage of the crop acreage in cotton. When the farm business was small and the crop yields were high, the farmers with a small percentage of their crop acreage in cotton made about the same labor income as the farmers with a large percentage of their crop acreage in cotton.

The average age of the operators included in this study was 51 years. As the average age increased the labor income decreased. There was no significant difference in the education of the younger and older operators. In 1950, 17 farmers had completed less than three grades of schooling while 25 had completed more than eight grades. Six farmers reported no formal education and two attended college. The most successful operators were those with the most education.

In general, the farmers who dusted their cotton the most times obtained the highest yields per acre of cotton. The farmers who planted cover crops obtained higher yields of cotton than the farmers who did not plant cover crops with about the same amount of fertilizer per acre. Most of the farmers surveyed fertilized cotton with some type of commercial fertilizer, but the application per acre on most farms was considerably below the recommended rates.

The size of the families included in this study varied from one to twelve persons. While 28 percent of the farms had more than five members per family, only 24 percent had more than six rooms per family.

The percent of the families reporting various conveniences were as follows: electric lights, 66; radio, 95; daily newspapers, 19; farm magazines, 82; ordinary life insurance on the family head, 13; automobile, 29; and home screened, 49.

RECOMMENDATIONS

In general, the following adjustments proved to be effective in achieving a higher standard of living and financial success on the farms that had made them. It is recognized that all of the adjustments cannot be followed on all of the farms. Inability to make some of them may be due to age, to the lack of desire on the part of individuals, to the lack of capital or to physical restrictions, such as poor soil, the layout of the farm, or the impossibility of obtaining a physical unit of the proper size to provide for the changes in farm organization that would be necessary to provide additional income. In some instances the size of the family, in others the educational limitations of the operator, may interfere with progressive farming.

Despite the inability of certian operators to attain the full objectives of profitable operations, it is believed that the following recommendations may contribute to a most satisfactory standard of living and a more remunerative system of farming in the area.

1. Use available land, capital, and labor resources to the fullest extent possible.
2. Grow as much food as possible for family use to reduce the cash expense for living.
3. Adjust the size of the farm business to employ the labor force efficiently.
4. Younger farmers especially might find it possible to use one or more of the following methods to increase their size of business: (a) rent additional land; (b) grow as much cotton as possible if the farm is large enough and the soil is adapted to cotton production to provide at least a full-time job for the family during harvest season; (c) diversify into livestock and other enterprises when a full-time job of cotton growing has been provided by the farm business; (d) use capital to provide good land and satisfactory buildings, equipment and livestock, but use it with extreme precaution so that debts can be liquidated by income from the use of borrowed capital and not bring the operator financial ruin; and (e) find work off the farm during the slack season.
5. Improve crop yields by: (a) applying at least 600 pounds of commercial fertilizer per acre of cotton, (b) plant from 25 to 50 percent of the cotton land each year to an adapted variety of winter legume, (c) use the best local variety of other seeds, (d) apply 6 to 7 applications or more of dust to control cotton insects during seasons of heavy infestation and frequent rainfalls.

In evaluating the desirability of these recommendations it must be remembered that the average price of 38 cents which these growers received for cotton was 5.6 times the price received for cotton in Mississippi during the disastrous cotton year of 1932. Any adjustments in the physical organization which require the excessive use of borrowed capital will be undertaken at the risk of a sharp decline in the price received for cotton—the main produce of these farms. The outlook as it appears today is more in the direction of a decrease in the farm price of cotton than an increase. Only another war would be expected to bring about any significant increase in the price growers may receive for the cotton crop.

APPENDIX A

Definitions

A farm is one or more tracts of land, including improvements, operated as a unit for agricultural production.

Acres operated is the total acres operated as a farm unit. Tracts of rented land are included as a part of the farm unit.

Acres in crops is the area on which crops, exclusive of pasture and woodland were planted during the year. If more than one crop is grown on any of the land during the year, the acreage is counted once to determine the "acres in crops."

Acres of crops or crop area refers to crops grown and not to land used. If double-cropping or inter-planting is practiced, the "acres or crops" will exceed the "acres in crops."

Productive-man-work units is the average amount of directly productive work accomplished by one man in a ten-hour day. The basis for calculating the productive-man-work units for the various farm enterprises are those developed for enterprises in Mississippi by the Department of Agricultural Economics at the Experiment Station there.

Man-work units are used in this study with the same meaning as productive-man-work units.

Man equivalent is the total months of man labor, including the operator, divided by 12. The time of women and children is reduced to its equivalent in man time.

Numbers of livestock of various kinds are the averages of the beginning and ending inventories, unless it was known that some other number more correctly represented the average number kept.

An animal unit represents an average mature horse, mule or cow or the equivalent in other livestock based on feed consumption and manure production.

Crop index is a number expressing the yield of all crops in percentage of some base. The base used in this study was the 1937 through 1941 crop yields for the Longleaf Pine Area of Mississippi weighted by the average number of man-work units used on the crop.

Farm capital includes the value of all farm property including real estate, livestock, feed and supplies on hand and equipment and machinery constituting the farming unit.

Total farm receipts is the sum of the total sales of stock and produce, increases in inventory, miscellaneous receipts from outside work, rent of farm buildings and land, agricultural conservation payments and so on.

Farm expenses include annual cash operating expenses, value of unpaid family labor other than that of the operator, decreases in inventory, and the cash cost of board or rations furnished hired labor. Any change in real estate value caused by a general change in the community is not included.

Farm income is the difference between the farm receipts and the farm expenses representing the combined return from the farm for the operator's labor and the use of the farm capital. It does not include the family living from the farm.

Labor income of the operator is what the farmer receives for his year's work over and above all farm expenses and interest on the capitalized value of the assets used. The value of the house and farm products consumed is in addition to labor income. Interest is figured on the entire capital whether or not there are debts. This measure is useful in comparing the earnings of a farmer with the wages of city workers, since the city worker must pay house rent, and buy all fuel and food out of his salary.

Operator's labor earnings is the labor income plus the value of the family living furnished the operator's household from the farm.

Labor returns per man is the labor income plus expenses for hired and cropper labor, board and rations, plus value of unpaid family labor, divided by the man equivalent.

Veteran refers in this report only to those owner-operators who were participating in the institutional on-the-farm training program for returned veterans at the time of the study.

APPENDIX B

Appendix Table 1. Productive-man-work units and animal units used in arriving at the total units per farm and crop yields per acre used in arriving at the crop index.

Item	Productive-man-work units	Crop yield per acre, 1937-41, Longleaf Pine area
Corn	3.2	15 bushels
Cotton	10.3	249 pounds
Hay:		
Cowpeas	2.4	1.0 ton
Oats, hay	2.4	1.0 ton
Lespedeza Serecia, grazing	1.1	1.3 tons
Lespedeza Serecia, harvested	2.4	1.3 tons
Soybean	2.4	1.0 ton
Soybean and cowpeas	2.4	1.0 ton
Mixed	2.4	1.0 ton
Oats for grazing	1.0	—
Oats harvested	2.4	-
Cucumbers	16.0	- -
Cane (syrup)	12.4	143 gallons
Watermelons	4.0	—
Peppers	37.0	- -
Sweet potatoes	11.0	96 bushels
Irish potatoes	11.7	63 bushels
Home orchard	3.0	—
Garden	14.7	—
Winter cover crop	1.0	—
Peanuts	6.0	471 pounds
Cowpeas for peas	9.0	6 bushels
Miscellaneous truck crops	14.7	—
Permanent pasture (estab.)	6.1	—
Permanent pasture (maintenance)	0.5	-
		Annual units
Mules	—	1.0
Horses	—	1.0
Colts	2.0	0.5
Steers	2.0	1.0
Bulls	2.0	1.0
Dairy cows, ordinary	13.8	1.0
Beef cows	2.8	1.0
Heifers	2.0	0.5
Calves	2.0	0.5
Boars	0.3	0.2
Brood sows with pigs	5.9	0.2
Brood sows without pigs	0.3	0.2
Hogs raised	0.3	0.1
Hens and other poultry	0.4	0.01
Pullets raised during year	0.2	0.01
Goats	0.1	0.07
Steers or other cattle fattened or only wintered	2.0	0.5
Miscellaneous:		
Each day worked or $4.00 receipts	1.0	
Each day worked with team or $6 receipts	1.0	
Each day worked with machinery or $8 receipts	1.0	
Each day worked with tractor or $10 receipts	1.0	
Lumber for every $10 receipts	2.0	
Firewood, per cord or $5 receipts	1.0	
Veteran's training (4 hrs. a week, 208 hrs. a year)	20.8	

Appendix Table 2. Averages of the farm business analysis factors, 155 farms, Jefferson Davis County, Mississippi, 1950.

Item	Farms of Veterans	Others	All farms
Number of farms	20	135	155
Financial returns:			
Operator's labor income	$1,266	$ 351	$ 469
Operator's labor earnings	$2,005	$1,063	$1,184
Labor returns per man	$1,174	$ 581	$ 649
Indebtedness of operator (farm and non-farm)	$ 494	$ 214	$ 250
Net worth of operator (personal)	$6,687	$7,197	$7,131
Size of business:			
Productive-man-work units	255.9	322.3	313.7
Farm enterprises	226	289	282
Cotton	63.1	98.8	94.2
Corn	32.0	49.3	47.0
Cattle	37.6	43.4	42.7
Area operated	72	89	87
Area of crops	26.4	33.4	32.5
Area of cotton	6.1	9.6	9.1
Area of corn	10	16	15
Number of men (man equivalent)	1.4	1.6	1.6
Animal units, except work animals	4.9	5.3	5.2
Total capital	$5,603	$6,115	$6,049
Total receipts[1]	$2,795	$2,059	$2,154
Total expenses[2]	$1,250	$1,403	$1,383
Non-farm receipts	$1,311	$ 273	$ 407
Farm cash receipts	$1,106	$1,478	$1,430
Combination of enterprise or diversity:			
Important sources of income and proportion of receipts from—			
Crops	$ 796	$1,055	$1,021
Cotton	$ 680	$ 899	$ 871
Livestock	$ 158	$ 230	$ 221
Miscellaneous non-farm sources[3]	$1,311	$ 273	$ 407
Percent of cash receipts from:			
Crops	33	60	56
Cotton	28	51	47
Percent of crop acreage (includes double crops) in:			
Cotton	23	29	28
Corn	38	47	46
Crop acres per animal unit, excluding work animals	4.4	5.2	5.1
Purchased fertilizer per acre of cropland	$ 9.56	$ 6.55	$ 6.94
Rates of production:			
Crop yield index	176.1	113.5	121.6
Bushels of corn per acre	36	20	22
Pounds of cotton per acre	283	235	241
Labor efficiency:			
Productive-man-work units per man	184.8	203.6	201.4
Acres in crops per man	19.1	21.1	20.9
Capital efficiency:			
Capital turnover (years required for receipts to equal capital)	2.0	3.0	2.8
Capital in real estate	$3,939	$4,300	$4,253
Working capital	$1,664	$1,815	$1,796
Miscellaneous:			
Age of operator	32	54	51
Value of operator's labor	$1,577	$1,312	$1,346
Price of cotton per pound	$ 0.38	$ 0.38	$ 0.38
Years of farm experience	15	34	31
Education of operator (grade completed)	8[4]	6	6

[1] Includes increases but not decreases in inventories.

[2] Includes decreases but not increases in inventories.

[3] Most of this is for Veterans on-farm training.

[4] Received technical training in addition to school grade completed.

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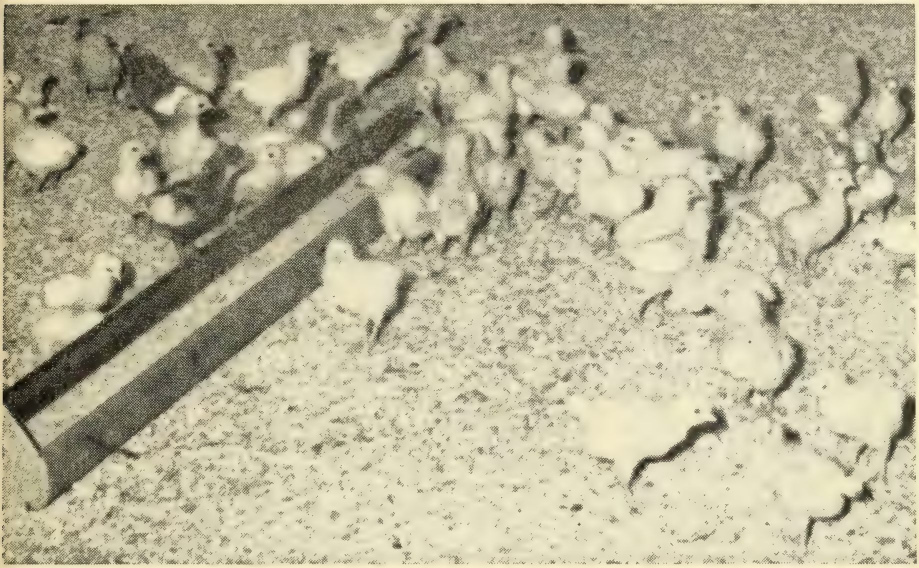

Investment, Cost And Returns To Broiler Production

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

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INVESTMENT, COSTS AND RETURNS TO BROILER PRODUCERS

By D. W. PARVIN

The Problem: Broiler production has been increasing in importance in Mississippi for a number of years. Approximately 35 million broilers were produced on Mississippi farms in 1953 compared to an average of about two million per year from 1943 through 1946.[1] Relatively high retail prices for beef and pork following World War II and continuing into the Korean War contributed to the increased consumer demand for poultry and the rapid expansion in the broiler industry in Mississippi after 1946. Relatively large amounts of family labor in relation to the land area on many small farms and the relative ease with which operating capital could be obtained from feed dealers also contributed greatly to the rapid increase of broiler production in Mississippi.

It is expected that the production of broilers in Mississippi will continue to increase for the following reasons: (1) the demand for meat will likely increase as consumers become better informed about nutrition and as the population increases; (2) a surplus of family labor is found on many small farms for which there is a lack of profitable alternative labor-consuming enterprises, and (3) the amount of fixed capital required to enter broiler production is small relative to other livestock enterprises, the operating capital can be obtained rather easily, and the return on money invested is obtained quickly. Relatively inexperienced producers who are planning on increasing the size of their broiler enterprise and persons contemplating producing broilers for the first time need basic information on investment, costs and returns under varying economic conditions on which to base decisions. This study was designed to provide such information.

Method of Study: In 1952 information on the variable cost of producing broilers and the value of broilers sold was collected by W. E. Christian, Jr., and Paul T. Blair for a random sample of producers from the records of feed dealers in Ittawamba, Lee, Pike, Rankin, Scott, Simpson, and Smith Counties. For those producers who were carried on open accounts, complete information was obtained on the number and cost of chicks started, the amount and cost of feed purchased, the cost of medicine, and the number, weights and value of birds sold. Information on miscellaneous cost items such as fuel and litter was incomplete because producers in some cases obtained these items from persons other than their feed dealers. This information was secured on approximately one million broilers produced on open accounts and was reported in Mississippi Experiment Station Bulletin number 515, "Broiler Production, Financing and Marketing in Mississippi."

In order to have complete information on investment costs and returns, a second study was initiated in 1953. In this study, data on the investment in broiler houses and equipment, the cost of repairs and insurance on houses and equipment, and complete information on the cost of fuel, litter and electricity were obtained by personal interview with 72 producers in the counties specified above. The producers interviewed were selected at random from the records of the feed dealers included in the first study. These 72 producers had 128 houses with a capacity of more than four hundred thousand birds and an annual production of approximately 1.5 million birds.

Resources Used and Management Practices

Buildings: Broiler houses on the 72 farms studied had a total capacity of

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[1] **Agricultural Statistics,** United States Department of Agriculture, 1944-1947, and **The Poultry and Egg Situation,** United States Department of Agriculture, October 1954.

6,022 birds per farm and 3,388 birds per house (Appendix Table 1). Capacity per farm varied from 1,550 to 17,500 birds and capacty per house from 500 to 12,000 birds. Of the 128 houses, 17 had a capacity of less than 2,000, 32 had a capacity of 2,000, 46 a capacity of 2,100 to 4,900, 12 a capacity of 5,000, and 21 a capacity of more than 5,000.

Floor space in the houses averaged 4,585 square feet per farm, 2,579 square feet per house and .76 square feet per bird. Fifty percent of the houses were 20 feet wide; another 21 percent were 30 feet wide. At the extremes, two houses were 50 feet wide and five houses 16 feet wide. Roofing material used on houses was divided almost equally between metal and composition. Foundations varied from concrete to poles, and sides were usually rough lumber or rough lumber and felt.

Equipment: The reported capacity of brooders was approximately the same as the capacity of houses. The capacities of individual brooders were reported as 500, 750, or 1,000 birds; an average of 750 birds were started per brooder. Sixty-one percent of the brooders were heated with gas and 39 percent with kerosene (Appendix Table 2).

Trough hand-feeders was the predominant type of feeders used. Sixty-two producers used trough hand feeders only, 6 used automatic feeders and trough hand feeders, and 4 used mortar box feeders or round swinging feeders alone or in combination with hand trough feeders (Appendix Table 3). Over half of the trough hand feeders were 4 feet long; the balance was mostly 5 and 6 feet long, although some 3 and 3.5 foot feeders were used. An average of 90 feet of feeder space was provided per 1,000 birds on the 62 farms using hand trough feeders only.

Automatic waterers were used on most farms. Fifty-three producers used automatic trough waterers only, 3 used automatic pan waterers only, 6 used hand waterers only and 10 used a combination of hand waterers and automatic waterers (Appendix Table 4). Almost three-fourths of the automatic trough waterers were 4 feet long; the balance were 3, 5, 6, or 8 feet long. On the 53 farms having automatic trough waterers an average of 15 feet of watering space was provided per 1,000 birds.

Broods per year; The number of broods per year varied from 2 to 5 and averaged 3.59 for the farms studied. Most operators produced either 3 or 4 broods per year.

Labor utilized: The average producer used 3.42 hours of chore labor per day for a period of 73 days in producing one brood. This amounted to 250 hours of chore labor per brood. In addition, an average of 45 hours of labor was used in preparing the house or houses for each brood.[2] This made a total of 295 hours per brood, or 49 hours per 1,000 birds started (Appendix Table 5).

The type of equipment used and the number of birds produced exerted considerable influence on the labor required for daily chores. The average producer used .57 hours of chore labor per day for each 1,000 birds started compared to .32 for producers using automatic feeders and automatic waterers, .59 for those using hand feeders and automatic waterers and .91 for those using hand feeders and hand waterers (Appendix Table 6). It should be recognized that all of these variations should not be attributed to the differences in equipment because producers using automatic equipment produced more birds and producers using hand equipment produced fewer birds than did the average producer. It is a well recognized fact that it does not take twice as long to care for 6,000 birds as it does to take care of 3,000 birds.

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[2] An average of 63 hours of labor was used when old litter was removed and the house cleaned and disinfected; 34 hours were used when the old litter was not removed. The old litter was removed on the average of every 2.52 broods.

Since the majority of producers used hand feeders and automatic waterers, it was possible to calculate the relationship of the size of the brood started to the number of hours of chore labor required daily when this type of equipment was used. When hand feeders and automatic waterers were used, the daily chore labor per 1,000 birds started varied from .94 hours when 3,000 birds were started to .59 hours when 6,000 birds were started and .45 hours when 10,000 birds were started (Appendix Table 7).

Production: For each 1,000 birds started the average producer sold 941 birds at an average weight of 2.8 pounds per bird; this amounted to 2,635 pounds per 1,000 birds started to 15,868 pounds per brood (Appendix Table 8).

Mortality: Based upon the number of chicks purchased and the number of birds sold, the percentage mortality averaged 5.9.

Feed Utilization: An average of 3.0 pounds of feed was used for each pound of meat sold; this amounted to 79 (100 pound) sacks of feed per 1,000 birds started and 476 sacks per brood.

Investment, Costs and Returns

Investment: Based upon 1953 prices, replacement cost of broiler houses and equipment amounted to $2,969, per farm or $490 per 1,000-bird capacity (Table 1). However, the average investment in broiler houses and equipment over the lifetime of these items would be one-half of the replacement cost or $1,484 per farm and $245 per 1,000-bird capacity. Houses accounted for 72 percent of the total investment in broiler enterprise, brooders for 14 percent, feeders for 12 percent and waterers for 2 percent.

Replacement cost of broiler houses averaged $2,130 per farm or $354 per 1,000-bird capacity. Replacement cost of houses per square foot of floor space averaged 46 cents and varied from 42 cents for houses with composition roofing to 52 cents for houses with metal roofing.

Replacement cost of houses as reported in this study included the cash cost of all material purchased and of all labor hired, plus the value of materials and labor furnished from the farm. Therefore, the cash cost of broiler houses would be less than the replacement cost (total value) on those farms where all or a part of the labor and materials, excluding roofing material, was furnished from the farm. Based upon information received from 12 producers who constructed broiler houses with their own or family labor and who purchased all of the materials used in construction, the average cash cost of constructing broiler houses amounted to 55 percent of the total value (replacement cost). Also, based upon information received from 12 other producers who furnished all labor and materials, except roofing material, from the farm, the average cash cost of construction amounted to 29 percent of the total value.

Table 1. Investment per farm. and per 1,000 bird capacity, Mississippi 1953

Item	Replacement cost		Investment[1]	
	Per farm	Per 1,000 birds	Per farm	Per 1,000 birds
	Dollars			
Houses	2,130	354	1,065	177
Brooders	402	67	201	34
Feeders	364	57	182	28
Waterers	73	12	36	6
Total	2,969	490	1,484	245

Source: Seventy-Two Producers, 1953.

[1] Average investment over the lifetime of houses and equipment.

Replacement cost of brooders averaged $402 per farm or $67 per 1,000-bird house capacity. Replacement cost of brooders per 1,000-bird capacity averaged $73 on farms having gas brooders and $53 on farms having kerosene brooders. All brooders were purchased.

The average replacement cost of feeders was $364 per farm or $57 per 1,000-bird capacity. Replacement cost of feeders per 1,000-bird capacity averaged $49 on farms having hand feeders and $114 on farms having automatic feeders. Practically all feeders were purchased.

The average replacement cost of waterers amounted to only $73 per farm. Replacement cost of waterers per 1,000-bird capacity averaged $12.19 for all farms and varied from $11.69 on farms having automatic waterers only to $15.86 on farms having hand waterers only. For all practical purposes all waterers were purchased.

Costs: Total costs amounted to $671 per 1,000 birds started, .67 cents per bird started, and 25.5 cents per pound of meat sold (Table 2). Cash expenditures accounted for 95 percent of total cost and non-cash items for 5 percent. Cash expenses averaged $637 per 1,000 birds started, 64 cents per bird started and 24.2 cents per pound of meat sold.

Feed was the most important item of cost, accounting for 70.5 percent of cash cost and 66.9 percent of total cost. Feed cost averaged $449 per 1,000 birds started, .45 cents per bird started and 17.04 cents per pound of meat sold. The price of broiler feed averaged $5.68 per 100 pounds.

The second most important item of cost was the purchase price of chicks. This item of expense accounted for 24.4 percent of cash cost and 23.2 percent of total cost. The cost of chicks amounted to $156 per 1,000 birds started, 15.6 cents per bird started and 5.91 cents per pound of meat sold. The price of chicks averaged $15.58 per 100.

Miscellaneous cash expenditures which included cost of medicine, fuel, litter, repair on houses and equipment, electricity, and insurance on houses amounted to only 5.1 percent of cash cost and 4.8 percent of total cost. These cash expenditures averaged $32.00 per 1,000 birds started, 3.2 cents per bird started and 1.23 cents per pound of meat produced. Cash costs per 1,000 birds started averaged $12.01 for medicine, $11.23 for fuel, $4.58 for litter, $3.03 for repairs on houses and equipment, $1.31 for electricity and $0.25 for insurance on houses.

Non-cash cost items (labor, depreciation and interest on investment) averaged $34 per 1,000 birds started, 3.4

Table 2. Cost of producing broilers, Mississippi, 1953.

Item	Per 1,000 birds started	Per bird started	Per pound of meat sold	Percent of cost	
				Cash	Total
	Dollars	Cents	Cents		
Feed	449.00	44.90	17.04	70.5	66.9
Chickens	155.80	15.58	5.91	24.4	23.2
Miscellaneous cash cost[1]	32.41	3.24	1.23	5.1	4.9
Total cash cost	637.21	63.72	24.18	100.0	95.0
Labor	18.86	1.89	.72		2.8
Depreciation	11.30	1.13	.43		1.7
Interest on investment	3.43	.34	.13		.5
Total non-cash cost	33.59	3.36	1.28		5.0
Total costs	670.80	67.08	25.46		100.0

Source: Seventy-Two Producers, 1953; and records of feed dealers as reported by Christian and Blair in Mississippi Agricultural Experiment Station Bulletin No. 514, March 1954.

[1] See Appendix Table 9 for details.

cents per bird started and 1.28 cents per pound of meat sold. These items of cost averaged $18.86 for labor, $11.30 for depreciation on houses and equipment, and $3.43 for interest on investment per 1,000 birds started.

Returns. The average total return was $733 per 1,000 birds started, 73.3 cents per bird started and 27.8 cents per pound of meat produced (Table 3). Broiler sales accounted for 96 percent of total returns and the value of manure produced for the balance. Cash receipts (value of broilers sold) amounted to $704 per 1,000 birds started, 70.4 cents per bird started and 26.70 cents per pound of meat sold. The value of manure produced amounted to $29 per 1,000 birds started, or about $7.50 per ton of feed fed[3]

Net cash returns (the difference between cash receipts and cash expenses) averaged $67 per 1,000 birds started, 6.7 cents per bird started and 2.52 cents per pound of meat sold. The difference between total returns and total costs represents the net return to the operator for management of the enterprise. Net returns averaged $62 per 1,000 birds started, 6.2 cents per bird started and 2.34 cents per pound of meat produced.

Returns to labor (total returns less all items of cost except labor) amounted to $81 per 1,000 birds started, 8.1 cents per bird started, 3.06 cents per pound of meat sold and $1.65 per hour of labor. If the value of manure produced were not included in returns, the return to labor would have averaged $53 per 1,000 birds started, 5.2 cents per bird started, 1.92 cents per pound of meat sold and $1.08 per hour of labor.

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[3] Calculation based upon the amount of plant food found in poultry manure as reported in Pennsylvania Agricultural Experiment Station Bulletin No. 469, **Production, Composition and Value of Poultry Manure,** by White, Holben and Richer. See Appendix Table 10.

Table 3. Returns to broiler producers, Mississippi, 1953.

Item	Per 1,000 birds started	Per bird started	Per pound of meat sold
	Dollars	Cents	Cents
Cash receipts (broiler sales)	704	70.4	26.70
Less cash expenses	637	63.7	24.18
Net cash returns	67	6.7	2.52
Cash receipts	704	70.4	26.70
Plus value of manure	29	2.9	1.10
Total returns	733	73.3	27.80
Less total costs	671	67.1	25.46
Net returns	62	6.2	2.34
Total returns	733	73.3	27.80
Less all costs except labor	652	65.2	24.74
Returns to labor[1]	81	8.1	3.06
Cash receipts	704	70.4	26.70
Less all costs except labor	652	65.2	24.74
Returns to labor[2]	52	5.2	1.96
Returns to labor per hour of labor[1]			1.65
Returns to labor per hour of labor[2]			1.08

Source: Seventy-two producers, 1953, and records of feed dealers as reported by Christian and Blair in Mississippi Agricultural Experiment Station Bulletin No. 514, March 1954.

[1] [illegible]udes the value of manure.

[2] [illegible] including the value of manure.

Returns Under Varying Price Conditions

On the whole returns to broiler producers were relatively favorable in 1953. However, it should be kept in mind that prices received for broilers fluctuate widely from year to year and even from brood to brood (Appendix Table 11). If prices received for broilers in 1953 had been 10 percent lower, the average producer would have operated at a loss. Also, prices paid for feed and other items used in producing broilers do not vary as much as prices received for broilers. This is important when prices received for broilers drop sharply. For example, prices received for broilers the first 6 months of 1954 were 8.9 percent lower than in 1953; whereas, prices paid for feed were only .5 percent lower. Based upon prices received and paid by broiler producers in Mississippi during the first six months of 1954,[4] it is estimated that net cash returns per 1,000 birds started averaged $16 during this period, as compared to $67 for 1953 (See Appendix Table 12 for other measures of profits).

The average producer is primarily interested in the cash cost of producing broilers instead of total costs as calculated in this study, because: (1) In almost all cases, the labor used in producing broilers is furnished by the producer or members of his family; and (2) once a broiler house has been built and equipped, the fixed costs (depreciation and interest on investment) occur whether or not broilers are produced. If a producer can estimate the cash cost of producing a brood of broilers and the price he will receive for broilers, he is in position to determine when to produce and when not to produce.

In this study it was found that the cost of feed and of chicks constituted 94.9 percent of the cash costs of producing broilers. If a producer knows how many pounds of feed he has been using to produce a pound of meat, the current price of feed and the current price of chicks, he can estimate the cash cost of producing a pound of broiler meat accurately enough for all practical purposes by using the formulae below.

For example, if the current cost of feed is 5.75 cents per pound, the current cost of chicks 16.25 cents each and a producer has been using 3.0 pounds of feed to produce a pound of meat, the estimated cash cost of producing a pound of poultry meat would be calculated as follows:

(1) 3.0 × 5.75 = 17.25
(2) .38 × 16.25 = 6.18
(3) 17.25 + 6.18 =23.43 ÷ .949 = 24.7¢

If the producer thought that on the basis of the best information available, the price of broilers would be 26 cents when the brood was ready to sell, he would expect a net cash return of 1.3 cents per pound of meat produced, or $34[7] net cash return per 1,000 birds started. On the other hand, if the producer thought that the price would be only 24 cents per pound when the brood was ready for sale, it would appear to be unprofitable to start a brood at that time.

Tables 4, 5 and 6 have been prepared for convenience in estimating the cash cost of producing a pound of broiler meat. They were computed by the for

FORMULAE FOR ESTIMATING COST OF PRODUCING BROILERS

(1) Pounds of feed used to produce one pound of meat × Cost of feed per pound = Cost of feed to Produce one pound of meat
(2) .38[5] × Cost per chick = Cost of chick to produce one pound of meat
(3) Cost of feed to produce one pound of meat + Cost of chick to produce one pound of meat ÷ .949[6] = Cash cost of producing one pound of meat

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[4] Agricultural Prices, United States Department of Agriculture, January-June 1954.

[5] In this study 2.64 pounds of meat were produced per chick started; therefore it took .38 a chick to produce one pound of meat.

[6] This formula is based upon the assumption that the cost of miscellaneous items will change at the same rate as feed and chicks.

Table 4. Estimated cash cost of producing one pound of broiler meat, at various prices of feeds and chicks,[1] when 2.8 pounds of feed is used per pound of meat produced.

Feed cost per 100 lbs.	Cost of chicks, dollars per 100								
	11	12	13	14	15	16	17	18	19
Dollars	Cents per pound								
3.50	14.7	15.1	15.5	15.9	16.3	16.7	17.1	17.5	17.9
3.75	15.5	15.9	16.3	16.7	17.1	17.5	17.9	18.3	18.7
4.00	16.2	16.6	17.0	17.4	17.8	18.2	18.6	19.0	19.4
4.25	17.0	17.4	17.8	18.2	18.6	19.0	19.4	19.8	20.2
4.50	17.7	18.1	18.5	18.9	19.3	19.7	20.1	20.5	20.9
4.75	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6
5.00	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.0	22.4
5.25	19.9	20.3	20.7	21.1	(21.5)	21.9	22.3	22.7	23.1
5.50	20.6	21.0	21.4	21.8	22.2	22.6	23.0	23.4	23.8
5.75	21.4	21.8	22.2	22.6	23.0	23.4	23.8	24.2	24.6
6.00	22.1	22.5	22.9	23.3	23.7	24.1	24.5	24.9	25.3
6.25	22.9	23.3	23.7	24.1	24.5	24.9	25.3	25.7	26.1
6.50	23.6	24.0	24.4	24.8	25.2	25.6	26.0	26.4	26.8
6.75	24.4	24.8	25.2	25.6	26.0	26.4	26.8	27.2	27.6
7.00	25.1	25.5	25.9	26.3	26.7	27.1	27.5	27.9	28.3

[1] Assuming that the cash cost of other items vary in proportion to changes in the price of feed and chicks.

Table 5. Estimated cash cost of producing one pound of broiler meat. at various prices of feed and chicks,[1] when 3.0 pounds of feed is used per pound of meat produced.

Feed cost per 100 lbs.	Cost of chicks, dollars per 100								
	11	12	13	14	15	16	17	18	19
Dollars	Cents per pound								
3.50	15.5	15.9	16.3	16.7	17.1	17.5	17.9	18.3	18.7
3.75	16.3	16.7	17.1	17.5	17.9	18.3	18.7	19.1	19,5
4.00	17.0	17.4	17.8	18.2	18.6	19.0	19.4	19.8	20.2
4,25	17.8	18.2	18.6	19.0	19.4	19.8	20.2	20.6	21.0
4.50	18.6	19.0	19.4	19.8	20.2	20.6	21.0	21.4	21.8
4.75	19.4	19.8	20.2	20.6	21.0	21.4	21.8	22.2	22.6
5.00	20.2	20.6	21.0	21.4	21.8	22.2	22.6	23.0	23.4
5.25	21.0	21.4	21.8	22.2	22.6	23.0	23.4	23.8	24.2
5.50	21.8	22.2	22.6	23.0	23.4	23.8	24.2	24.6	25.0
5.75	22.6	23.0	23.4	23.8	24.2	24.6	25.0	25.4	25.8
6.00	23.4	23.8	24.2	24.6	25.0	25.4	25.8	26.2	26.6
6.25	24.2	24.6	25.0	25.4	25.8	26.2	26.6	27.0	27.4
6.50	25.0	25.4	25.8	26.2	26.6	27.0	27.4	27.8	28.2
6.75	25.7	26.1	26.5	26.9	27.3	27.7	28.1	28.5	28.9
7.00	26.5	26.9	27.3	27.7	28.1	28.5	28.9	29.3	29.7

[1] Assuming that the cash cost of other items vary in proportion to changes in the price of feed and chicks.

mula used above. If a producer has been using 2.8 pounds of feed to produce a pound of meat, he would use Table 4 to determine his estimated cost of production. If the current price of feed is 5.25 cents per pound and the current price of chicks 15 cents each, his estimated cash cost of production would be 21.5 cents per pound (see figure in parenthesis). If the price of feed was 6.25 cents per pound and the price of chicks 16 cents each, his estimated cash cost of production would be 24.9 cents per pound (read down from 16 cents and across from 6.25 cents until the row and column of figures intersect). Tables 5 and 6 may be used in a similar manner by

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[7] In this study, an average of 2,635 pounds of broiler meat was produced per 1,000 birds started; therefore, 2,635 × 1.3 cents = $34.26

Table 6. Estimated cash cost of producing one pound of broiler meat, at various prices of feed and chicks,[1] when 3.2 pounds of feed is used per pound of meat produced.

Feed cost per 100 lbs.	Cost of chicks, dollars per 100.								
	11	12	13	14	15	16	17	18	19
Dollars	Cents per pound								
3.50	16.2	16.6	17.0	17.4	17.8	18.2	18.6	19.0	19.4
3.75	17.0	17.4	17.8	18.2	18.6	19.0	19.4	19.8	20.2
4.00	17.9	18.3	18.7	19.1	19.5	19.9	20.3	20.7	21.1
4.25	18.7	19.1	19.5	19.9	20.3	20.7	21.1	21.5	21.9
4.50	19.6	20.0	20.4	20.8	21.2	21.6	22.0	22.4	22.8
4.75	20.4	20.8	20.2	21.6	22.0	22.4	22.8	23.2	23.6
5.00	21.2	21.6	22.0	22.4	22.8	23.2	23.6	24.0	24.4
5.25	22.1	22.5	22.9	23.3	23.7	24.1	24.5	24.9	25.3
5.50	22.9	23.3	23.7	24.1	24.5	24.9	25.3	25.7	26.1
5.75	23.8	24.1	24.5	24.9	25.3	25.7	26.1	26.5	26.9
6.00	24.6	25.0	25.4	25.8	26.2	26.6	27.0	27.4	27.8
6.25	25.4	25.8	26.2	26.6	27.0	27.4	27.8	28.2	28.6
6.50	26.3	26.7	27.1	27.5	27.9	28.3	28.7	29.1	29.5
6.75	27.1	27.5	27.9	28.3	28.7	29.1	29.5	29.9	30.3
7.00	28.0	28.4	28.8	29.2	29.6	30.0	30.4	30.8	31.2

[1] Assuming that the cash cost of other items vary in proportion to changes in the price of feed and chicks.

Table 7. Estimated net cash returns for broods of varying sizes,[1] when the net cash return per pound of meat produced varies from one-half cent to five cents.

Number of birds started	Net cash returns per pound of meat produced, cents								
	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0
	Dollars per brood								
1,000	13	26	40	53	66	79	92	105	132
2,000	26	53	79	105	132	158	184	211	264
3,000	40	79	119	158	198	237	277	316	395
4,000	53	105	158	211	264	316	369	422	527
5,000	66	132	198	264	(329)	395	461	527	659
6,000	79	158	237	316	395	474	553	632	790
7,000	92	184	277	369	461	553	646	738	922
8,000	105	211	316	422	527	632	738	843	1,054
9.000	119	237	356	474	593	711	830	949	1,186
10,000	132	264	395	527	659	790	922	1,054	1,318

[1] In this study, 2,635 pounds of broiler meat (liveweight) was produced per 1,000 birds started (941 birds at 2.8 pounds each).

producers using 3.0 or 3.2 pounds of feed to produce a pound of meat.

Table 7 has been prepared for convenience in estimating the net cash return from broods of varying sizes. The producer can estimate his net cash return per pound of meat[8] produced by deducting his estimated cash costs of producing a pound of meat from the price he expects to receive when the brood is ready to sell. If a producer estimates that his net cash return per pound of meat produced will be 2.5 cents, his estimated net cash return from a brood of 5,000 birds would be $329 (see figure in parenthesis, Table 7). If his estimated net cash returns per pound of meat produced were three cents his estimated net cash returns from a brood of 5,000 birds would be $395 (read down from 3.0 cents and across from 5,000 until the row and column of figures intersect).

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[8] The estimated cash cost per pound can be taken from Tables 4, 5, or 6, or it can be calculated by the formula given in this report.

Summary and Conclusions

Broiler production is well adapted to the many small farms of Mississippi with their surplus or unused family labor. The broiler industry in Mississippi has increased rapidly from about two million birds in 1946 to 35 million birds in 1953.

The information on which this study of investment, costs and returns to broiler producers is based was collected from 52 feed dealers in 1952 and 72 producers in 1953. The data presented on investment, costs and returns are based upon 1953 prices.

The average producer had a house capacity of approximately 6,000 birds and produced an average of 3.59 broods per year. There was an average of .76 square feet of floor space per bird, one brooder for every 750 birds, and 90 feet of feeder space and 15 feet of watering space per 1,000 birds.

Labor used averaged 295 hours per brood or 49 hours per 1,000 birds started.

An average of 2,635 pounds of meat (liveweight) was sold per 1,000 birds started. Broilers were sold at an average weight of 2.8 pounds.

Based upon the numbers of chicks purchased and sold, mortality averaged 5.9 percent.

An average of 3.0 pounds of feed was used for each pound of meat sold.

Replacement cost of broiler houses and equipment amounted to $2,969 per farm or $490 per 1,000-bird capacity. However, the average investment in houses and equipment over the lifetime of these items would be one-half of replacement cost or $1,484 per farm and $245 per 1,000 bird capacity. Houses accounted for 72 percent of the total investment in the broiler enterprise, brooders for 14 percent, feeders for 12 percent and waterers for 2 percent.

Total costs, of which cash expenditures accounted for 95 percent, amounted to $671 per 1,000 birds started and 25.5 cents per pound of meat sold. Cash costs averaged $637 per 1,000 birds started and 24.2 cents per pound of meat sold. Feed accounted for 70.5 percent of cash costs, chickens for 24.4 percent and miscellaneous items for 5.1 percent.

Total returns, of which broiler sales accounted for 96 percent and the value of manure produced for 4 percent, amounted to $733 per 1,000 birds started and 27.8 cents per pound of meat sold. Cash receipts averaged $704 per 1,000 birds started and 26.7 cents per pound of meat sold. Net cash returns averaged $67, net returns $62, returns to labor $81 and returns to labor (not including the value of manure produced) $53 per 1,000 birds started.

On the whole returns to broiler producers were relatively favorable in 1953. However, if prices received for broilers had been 10 percent lower, the average producer would have operated at a loss. Prices received for broilers fluctuate widely from brood to brood and much more than prices paid for feed and other items used in producing broilers. For this reason, the date a brood is started has considerable influence on the profit or loss made. Therefore, the producer should attempt to estimate the cost of producing broilers and the price he will receive for broilers when they are ready for sale, before a brood is started. If the producer uses the best information available in making these estimates, he will be in a better position to determine when to start a brood and when to stay out of production.

Once broiler houses have been erected and equipped, a producer is primarily interested in cash costs because the non-cash costs occur whether or not broilers are produced. Since the costs of feed and of chicks constituted 94.9 percent of the cash costs of producing broilers in this study, it should be relatively easy for a producer to estimate the cash cost of producing broilers. A knowledge of the number of broiler chicks placed in recent weeks, the prospective supply of other meats, the current prices of broilers and the trend of economic conditions in general will be of great value to a producer in estimating the price he will probably receive for broilers started on a given date.

Appendix Table 1. Broiler houses: investment, costs and miscellaneous data, Mississippi, 1953.

Item	All farms	Houses classified by type of roof	
		Metal	Composition
Capacity per house[1] (No. of birds)	3,388	3,682	3,178
Capacity per farm[1] (No. of birds)	6,022	[2]	[2]
Floor space per bird (Square feet)	.76	.75	.77
Replacement cost per house (Dollars)	1,198	1,434	1,025
Replacement cost per farm (Dollars)	2,130	[2]	[2]
Replacement cost per 1,000 bird capacity (Dollars)	354	389	323
Replacement cost per square foot of floor space (Cents)	.46	.52	.42
Average age of houses (years)	3.72	3.14	4.07
Average total years useful life of houses	15.08	15.00	15.37
Average number of broods per year	3.59	3.45	3.68
Annual cost per year: (Dollars			
Depreciation	141.25	95.60	66.69
Repairs	42.61	22.08	24.29
Interest	53.25	35.85	25.62
Insurance	5.31	1.82[3]	4.17
Total per farm	242.42	155.35	120.77[3]
Total per brood	67.53	45.03	32.82
Total per 1,000 birds	11.21	12.23	10.33
Number of houses	128	56	63

Source: Seventy-two producers, 1953.

[1] One brood.

[2] Some farms had both types of houses.

[3] Total per house.

Appendix Table 2. Brooders: investment, costs and miscellaneous data, Mississippi, 1953.

Item	All farms	Type of brooder	
		Gas	Kerosene
Number of farms	72	40	31
Number of brooders	578	354	224
Birds per brooder	750	826	630
Capacity of houses per farm (No. of birds)	6,022	7,310	4,555
Replacement cost per 1,000-bird house capacity (Dollars)	67	73	53
Average total useful life (Years)	11.11	12.10	9.88
Average number of broods per year	3.59	3.56	3.63
Annual cost per farm: (Dollars)			
Depreciation	36.20	44.26	24.58
Repairs	21.69	27.41	15.00
Interest	10.05	13.40	6.07
Total per farm	67.94	85.07	45.65
Total per brood	18.92	23.90	12.58
Total per 1,000 birds	3.14	3.27	2.76

Source: Seventy-two producers. 1953.

Appendix Table 3. Feeders: investment, costs and miscellaneous data, Mississippi, 1953.

Item	All farms	Type of eeder	
		Hand[1]	Automatic[2]
Number of farms	72	66	6
Capacity of houses per farm (No. of birds)	6,022	5,738	9,150
Average total useful life (Years)	-------	6.61	9.40[3]
Average number of broods per year	3.59	3.54	3.93
Replacement cost per farm (Dollars)	364	302	1,045
Replacement cost per 1,000-bird house capacity (Dollars)	57	49	114
Annual cost per farm: (Dollars)			
Depreciation	52.18	45.73	123.06
Repairs	1.11	-------	13.33
Interest	9.11	7.56	26.12
Total per farm	62.40	53.29	162.51
Total per brood	17.38	15.05	41.35
Total per 1,000 birds	2.89	2.62	4.52

Source: Seventy-two producers, 1953.

[1] Sixty-two producers used trough and hand feeders only and 4 producers used motor box feeders or round swinging feeders alone or in combination with trough and hand feeders.

[2] All farms having automatic feeders also had some hand feeders.

[3] For automatic feeders only.

Appendix Table 4. Waterers: investment, costs and miscellaneous data, Mississippi, 1953.

Item	All farms	type of waterer[1]	
		Automatic	Hand
Number of farms	72	56	6
Capacity of houses per farm (No. of birds)	6,022	6,688	2,167
Average total useful life (Years)	- -	4.72	8.80
Average number of broods per year	3.59	3.51	3.83
Replacement cost per farm (Dollars)	73	78	34
Replacement cost per 1,000 bird house capacity (Dollars)	12	12	16
Annual cost per farm: (Dollars)			
Depreciation	14.66	16.56	3.90
Interest	1.84	1.95	.86
Total per farm	16.50	18.51	4.76
Total per brood	4.60	5.27	1.24
Total per 1,000 birds	.76	.79	.57

Source: Seventy-two producers. 1953.

[1] Fifty-three producers used automatic trough waterers only; three used automatic pan waterers only; six used hand waterers only; and ten used a combination of hand waterers and automatic waterers.

Appendix Table 5. Hours of labor required per brood. per farm and per 1,000 birds started.

Item	Per brood	Per 1,000 birds started
Preparing houses	45	7.5
Daily chores	250	41.5
Total	295	49.0
Value of labor used per 1,000 birds started (dollars)[1]		18.86

Source: Seventy-two producers, 1953.

[1] Based upon the prevailing wage rate of $3.85 per day (38.5 cents per hour); Agricultural Prices, United States Department of Agriculture, 1953.

Appendix Table 6. Daily chore labor required per 1,000 birds started related to type of equipment, Mississippi, 1953.

Type of equipment	Number of birds started	Daily chore labor (hours)	
		Per brood	Per 1,000 birds started
Automatic waterers	9,150	2.96	.32
Hand feeders and hand waterers	2.167	1.97	.91
Hand feeders and automatic waterers	5,961	3.51	.59
All producers	6,022	3.42	.57

Source: Seventy-two producers, 1953.

Appendix Table 7. Relationship of size of brood to the daily chore labor required on farm using hand feeder and automatic waterers, Mississippi, 1953.

Number of birds started	Daily chore labor (hour)[1]	
	Per brood	Per 1,000 birds started
2,000	2.58	1.29
3,000	2.83	.94
4,000	3.07	.77
5,000	3.31	.66
6,000	3.55	.59
7,000	3.79	.54
8,000	4.04	.51
9.000	4.28	.48
10,000	4.52	.45

Source: Forty-four producers using hand feeder and automatic waterers only.

[1] Calculation based upon the formula $y = 2.10 + .242X$. Estimated by regression techniques.

Appendix Table 8. Birds purchased, birds sold, weight of birds sold, and feed used, per brood and per 1,000 birds started, Mississippi, 1953.

Item	Per brood	Per 1,000 birds started[2]
Birds purchased[1]	6,022	1,000
Birds sold	5,667	941
Total weight of birds sold, pounds	15,868	2,635
Feed used, pounds	47,604	7,905
Average weight of birds sold		2.8
Feed used per pound of broiler meat sold, pounds		3.0

Source: Seventy-two producers, 1953; and records of feed dealer as reported by Christian and Blair in Mississippi Agricultural Experiment Station Bulletin No. 514, March, 1954.

[1] An average of 1,022 birds were delivered to producer for each 1,000 birds purchased.

[2] In this study, birds started refers to birds purchased.

Appendix Table 9. Miscellaneous cash expenditures for broiler production, Mississippi, 1953.

Item	Per 1,000 birds started	Per bird started	Per pound of meat sold
	Dollars	Cents	Cents
Medicine	12.01	1.20	.46
Fuel	11.23	1.12	.43
Litter	4.58	.46	.17
Repairs on house and equipment	3.03	.30	.11
Electricity	1.31	.13	.05
Inusrance on house	.25	.03	.01
Total	32.41	3.24	1.32

Source: Seventy-two producers, 1953; and record of feed dealers as reported by Christian and Blair in Mississippi Agricultural Experiment Station Bulletin No. 514, March, 1954.

Appendix Table 11. Average monthly farm prices per pound commercial broilers. Mississippi, 1940-1954.

Year	Month												Average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
								Cents					
1940	16.0	17.0	19.0	21.0	24.0	20.0	18.0	18.0	16.0	16.0	16.0	18.0	19.3
1941	18.0	19.0	21.0	21.0	19.0	18.0	20.0	19.0	18.0	19.0	19.0	19.0	19.5
1942	20.0	21.0	22.0	23.0	23.0	24.0	24.0	24.0	25.0	26.0	26.0	26.0	23.2
1943	28.0	28.0	28.0	29.0	29.0	29.0	29.0	28.0	28.0	28.0	28.0	27.0	28.4
1944	29.0	30.0	30.0	31.0	33.0	32.0	30.0	25.0	26.0	30.0	31.0	31.0	30.4
1945	32.0	32.0	32.0	33.0	33.0	33.0	32.0	32.0	32.0	29.0	29.0	26.0	31.5
1946	29.0	27.0	29.0	34.0	36.0	33.0	35.0	37.0	39.0	34.0	31.0	34.0	33.0
1947	30.0	28.0	29.0	35.0	37.0	34.0	36.0	38.0	40.0	35.0	32.0	35.0	34.0
1948	37.0	33.0	36.0	39.0	38.5	40.0	36.5	36.5	36.5	31.5	31.5	34.0	36.0
1949	30.0	27.0	30.0	31.0	29.0	28.5	28.0	29.0	29.0	29.0	31.0	26.5	29.0
1950	24.0	27.0	29.0	29.5	28.0	26.5	29.5	31.5	31.0	27.0	25.0	24.0	28.0
1951	28.0	29.5	32.0	30.0	28.0	30.0	30.0	31.0	30.0	27.0	27.0	28.0	29.3
1952	29.0	29.0	27.0	25.0	24.0	26.0	29.5	30.0	30.0	28.0	30.5	28.5	28.0
1953	27.0	27.0	27.5	27.0	27.0	26.0	27.0	26.5	26.5	27.0	26.0	25.0	26.7
1954	24.5	23.0	23.0	23.5	23.0	23.0							

Source: Agricultural Prices, United States Department of Agriculture.

Appendix Table 10. Amount and value of plant food in poultry manure, Mississippi, 1953.[1]

Item	Per. 1,000 birds started	Per ton of feed fed
Pounds of plant food:[2]		
Nitrogen	130	32.9
Phosphate, P_2O_5	132	33.4
Potash, K_2O	69	17.5
Value of plant food (dollars):[3]		
Nitrogen, N	15.60	3.95
Phosphate. P_2O_5	9.24	2.34
Potash, K_2O	4.14	1.05
Total	28.98	7.34

Source: Calculations based upon the amount of plant food found in poultry manure as reported in Pennsylvania Experiment Station Bulletin No. 469, **Production, Composition, and Value of Poultry Manure,** by White, Holben, and Richer.

[1] The amount of manure produced per 1,000 birds started and per ton of feed fed would vary depending on the amount of litter and moisture in the manure; it would probably vary between two and three tons per 1,000 birds started and between .5 and .8 tons per ton of feed fed.

[2] In the manure when taken from the broiler house.

[3] Based upon the 1953 cost of plant food in straight materials; the value would be about 50% higher if calculated on the basis of plant food in mixed fertilizer.

Appendix Table 12. Estimated costs and returns to broiler producers, Mississippi, January-June, 1954.

Item	Per 1,000 birds started	Per bird started	Per pound of meat sold
	Dollars	Cents	Cents
Feed	447.	44.7	16.96
Chickens	147.	14.7	5.58
Miscellaneous costs	31.	3.1	1.18
Total cash cost	625.	62.5	23.72
Non-cash cost	34.	3.4	1.28
Total costs	659.	65.9	25.00
Cash receipts (broiler sales)	641.	64.1	24.33
Less cash expenses	625.	62.5	23.72
Net cash returns	16.	1.6	.61
Cash receipts	641.	64.1	24.33
Plus value of manure	29.	2.9	1.10
Total returns	670.	67.0	25.43
Less total costs	659.	65.9	25.00
Net returns	11.	1.1	.43
Total returns	670.	67.0	25.43
Less all costs except labor	640.	64.0	24.28
Returns to labor[1]	30.	3.0	1.15
Cash receipts	641.	64.1	24.33
Less all costs except labor	640.	64.0	24.28
Returns to labor[2]	1.	.1	.05
Returns to labor per hour of labor[1]			61.2
Returns to labor per hour of labor[2]			2.0

Source: Cost and income data in Tables 2 and 3 adjusted to January-June, 1954 prices (Agricultural Prices United States Department of Agriculture, January-June, 1954).

[1] Including the value of manure.

[2] Not including the value of manure.

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1954 Cotton
Variety and Irrigation

Tests in the Hill Sections of Mississippi

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

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VARIETIES COMPARED IN IRRIGATION STUDY AT STATE COLLEGE

By E. A. KIMBROUGH and J. F. O'KELLY

A test set up to determine if widely grown cotton varieties respond in the same way to irrigation was continued. The twelve varieties used included some of the earliest and latest as well as the longest and shortest now being grown. Acala 4-42, a variety grown under irrigation in California, was included.

The test received 700 pounds 6-8-8 fertilizer to the acre at the time of planting on April 22. Due to frost damage the test was planted over May 17.

There were twelve replications arranged in six pairs. One replication of each pair was selected at random for irrigation. The other replication of each pair received no irrigation. Water was applied as follows using a sprinkler system:

May 25	0.8 inch
August 4	2.4 inch
August 13	2.7 inch
August 20	2.4 inch
	8.3 inches

On this part of the farm rains enabled the plants to make fair growth in June and July. Since the test was planted late, the plants did not reach their flowering peak until the first half of August. At this time the maximum daytime temperatures were near 100 degrees, sometimes higher. The August applications of water were, therefore, made at the time when the plants needed the water most. A rain of 1.22 inches fell after the irrigation of August 20. It is not possible to assess the effect of this rain on the results. The May 25 application of 0.8 inch was made on the irrigated plots to insure prompt germination. However, a later check on stands indicated that this did not help. Soil moisture at the second planting was evidently sufficient for germination on all plots.

The total cost of water applied was estimated at $25.15 per acre. This includes labor, depreciation, interest on investment, etc.

The accompanying table shows, in addition to other things, the average gain in pounds of lint cotton and the value of the gain (both seed and lint). These values are for middling grade cotton and the calculations were made as for an ordinary variety test. Similar gains were

Cotton varieties with and without irrigation, State College, 1954.

	Pounds lint per acre			Total acre value, $			Lint percentage	Staple inches	Bolls per lb. lint	
	Irrigated	Not irrigated	Increase	Irrigated	Not irrigated	Increase	Irrigated	Irrigated	Irrigated	Not irrigated
Acala 4-42	990	730	260	412	303	109	38.7	1 1/16	151	155
Coker Wilt	931	642	289	411	272	139	35.0	1 1/8	207	215
Hi-Bred	920	672	248	359	263	96	40.9	15/16	155	172
Plains	892	699	193	376	286	90	36.4	1 1/16	196	198
Delfos 7343	867	662	205	368	278	90	37.4	1 3/32	214	226
Delfos 9169	856	682	174	377	292	85	35.2	1 1/8	194	202
Deltapine 15	798	663	135	334	271	63	39.8	1 3/32	202	208
Fox	790	615	175	336	256	80	36.6	1 3/32	247	258
Stoneville 2B	790	674	116	336	278	58	35.0	1 1/16	191	194
Empire	758	638	120	321	269	52	36.0	1 1/16	170	173
Bobshaw 1A	754	582	172	319	246	73	35.9	1 1/16	228	227
Wilds	653	552	101	349	293	56	31.5	1 1/4	227	236
Average			182			83			198	205

obtained in 1952. In 1953 rainfall, totaling more than five inches, fell in mid July. As a result the only irrigation was in August and produced no gain.

Insect control was reasonably adequate and was uniform for the entire area.

When the 1952 and 1954 results are considered together there is some indication that varieties which have the ability to flower over a long period will produce the greatest yields under irrigation provided insect control is adequate. This probably would not be true, however, near the northern limit of cotton production. Early, rapid fruiting types will still be required there.

1954 COTTON VARIETY TESTS IN HILL SECTIONS

By J. F. O'KELLY, BURKE C. MURPHY, B. C. HURT and S. P. CROCKETT

In a season with as little rain as fell in the state during the summer of 1954 it is not possible to evaluate the yielding ability of cotton varieties. All of the better varieties now available to the cotton grower have potential yields well above a bale to the acre and many as much as two to three bales. The results of tests conducted last summer are reported, however, since they show some of the other comparative characteristics of the varieties. It will be worth noting also that even with the extremely low yields it would be difficult to name a farm enterprise for extensive use in these areas which would return more per acre than cotton under such conditions.

For computing values the lint prices used for the various staple lengths were averages for ten weeks of the Memphis marketing season beginning with the last week in August. The value used for seed was $66.00 a ton. Values used in the averages were based on middling grade. Computations were made at State College. The field plot work and collection of field weights at the branch stations were handled by those in charge of the respective stations.

The test at the Coastal Plain Station, Newton, was planted April 27 with 600 pounds 12-8-8 fertilizer to the acre. It received three applications of toxaphene. This test was on Prentiss soil. The location has a subsurface hard pan which usually retards growth and fruiting in both dry and wet seasons. There were numerous showers during May, June, and July but many were too light to affect plant growth although they may have aided insect survival.

The test at State College was planted in the latter half of April but due to spotted damage by frost it was planted over May 20. Six hundred pounds of 6-8-8 fertilizer was applied at first planting. Toxaphene for insect control was applied five times. There was no serious buildup of weevils or other insects. The low yields were due largely to the late planting combined with an extreme deficiency in soil moisture.

The Holly Springs test was planted May 10 after an application of 500 pounds 8-8-4 fertilizer on April 23. The crop was sidedressed with 150 pounds ammonium nitrate to the acre June 10. The test was dusted early with toxaphene for thrips control but the weevil infestation did not become great enough to justify the further use of an insecticide.

The Pontotoc Ridge test was planted April 27 and the Flatwoods test May 12. Both tests were fertilized with 400 pounds 12-8-8 fertilizer at planting and were later sidedressed with 30 pounds of nitrogen. These tests received four applications of Toxaphene dust.

The reader should bear in mind that all of the varieties tested are good producers in their areas of adaptation and many of them are quite widely adapted. These include Deltapine 15, Coker Wilt, Stoneville 2B, and Empire. Bobshaw 1A should be included where a somewhat stronger fiber is wanted. Acala 4-42 performed better than usual, especially in the irrigation test. Growers should be careful in the use of Acala. In a rainy season without adequate insect control it would probably grow to enormous height and result in the rotting of any lower bolls.

Where fusarium wilt is a problem Coker Wilt, Plains, Empire, and Auburn 56 should be considered. These varieties may not resist all strains of wilt but they are the most resistant varieties available.

Cotton varieties, State College, 1954.

	Pounds lint per acre	Total acre value			Lint percentage	Staple inches	Bolls per lb. lint
		Middling	Strict low middling	Low middling			
Empire	392.7	161.07	154.98	140.85	36.8	1	184
Fox	378.4	154.31	148.45	134.83	37.8	1	251
Delfos 7343	378.3	153.84	147.98	134.36	38.3	1	236
Auburn 56	375.2	154.73	148.92	135.41	35.9	1	237
Hi-Bred	371.6	132.41	128.69	122.19	41.6	13/16	171
Stoneville 5A	370.2	150.89	145.15	131.82	37.9	1	222
Miller	362.2	138.50	133.43	124.38	38.2	29/32	197
Plains	358.6	143.03	138.72	125.46	38.0	31/32	202
Deltapine 15	348.4	137.23	133.05	130.16	40.3	31/32	223
Acala 4-42	345.8	141.39	136.20	124.44	40.3	1 1/32	171
Delfos 9169	340.2	143.97	138.53	127.47	35.8	1 1/16	213
Coker Staple	336.5	141.76	136.71	125.27	35.0	1 1/32	238
Stoneville 2B	333.8	135.00	131.00	118.64	35.7	31/32	205
Louisiana 33	314.2	125.98	122.21	110.58	37.1	31/32	233
Bobshaw 1A	289.6	121.86	117.51	107.67	35.2	1 1/32	255
Coker Wilt	294.6	124.43	116.86	106.26	36.0	1	235

Average results from cotton varieties, State College.

	Pounds lint per acre					Averages				
	1950	1951	1952	1953	1954	Lint	Acre values	Lint percentage	Length inches	Bolls per lb. lint
Deltapine	556	523	601	726	348	551	233.45	40.0	1 1/32	193
Delfos 7343	431	532	615	771	378	545	234.16	37.8	1 1/16	202
Fox	490	556	565	732	378	544	232.98	37.2	1 1/32	216
Miller	465	516	602	776	362	544	226.45	37.5	31/32	175
Plains	469	514	640	683	359	533	277.33	37.5	1 1/32	178
Coker Staple	436	485	627	750	336	527	240.39	35.5	1 1/16	206
Hi-Bred	336	548	520	758	372	507	195.53	41.2	7/8	154
Empire	307	503	568	730	393	500	212.39	36.7	1 1/32	166
Delfos 9169	360	477	668	645	340	498	216.65	35.8	1 1/16	187
Stoneville 2B	347	455	632	718	334	497	211.11	36.6	1 1/32	179
Coker Wilt	411	509	586	621	295	484	210.58	36.4	1 1/16	194
Bobshaw 1A	396	442	556	617	290	460	197.32	36.5	1 1/32	207

Cotton varieties, Holly Springs, 1954.

	Pounds lint per acre	Total acre value			Lint percentage	Length inches	Bolls per lb. lint
		Middling	Strict low middling	Low middling			
Hi-Bred	376.1	138.62	133.73	125.08	42.0	7/8	184
Miller	343.7	136.93	132.80	120.09	38.2	31/32	223
Deltapine 15	332.9	136.81	131.82	120.50	39.3	1 1/32	214
Stoneville 2B	331.8	138.34	133.36	122.08	36.7	1 1/32	219
Plains	330.0	132.00	128.04	115.83	37.5	31/32	223
Fox	325.4	135.66	130.78	119.72	36.7	1 1/32	276
Stoneville 5A	314.3	127.75	122.87	111.56	38.4	1	241
Auburn 56	308.4	128.58	123.96	113.47	36.7	1 1/32	240
Delfos 7343	303.5	125.74	121.19	110.87	37.8	1 1/32	273
Bobshaw 1A	295.4	124.86	120.13	110.53	36.0	1 1/16	270
Coker Wilt	293.0	124.06	119.37	109.85	35.7	1 1/16	243
Delfos 9169	292.9	124.11	119.42	109.90	35.6	1 1/16	231
Louisiana 33	285.6	118.66	114.37	104.66	37.3	1 1/32	233
Acala 4-42	281.9	116.97	112.46	103.30	39.3	1 1/16	200
Coker Staple	278.8	117.91	113.45	104.39	35.9	1 1/16	247
Empire	278.5	115.32	111.14	101.67	37.9	1 1/32	188

Average results from cotton varieties, Holly Springs.

	Pounds lint per acre					Averages				
	1950	1951	1952	1953	1954	Lint	Acre values	Lint percentage	Length inches	Bolls per lb. lint
Fox	572	474	466	488	325	465	200.47	37.4	1	237
Plains	593	404	450	495	330	454	192.97	38.3	31 32	199
Hi-Bred	426	411	415	597	376	445	171.73	42.1	27/32	167
Delfos 9169	568	456	447	431	293	439	192.18	36.6	1 1/16	203
Coker Wilt	573	406	414	444	293	426	184.96	37.2	1 1/32	207
Miller	484	408	405	486	344	425	176.93	38.1	15/32	198
Stoneville 2B	518	430	460	379	332	424	184.15	37.1	1 1/32	199
Deltapine 15	526	399	452	401	333	422	179.27	40.0	1	206
Empire	502	381	456	473	278	418	179.01	38.7	1 1/32	174
Bobshaw 1A	534	424	439	375	295	413	178.07	37.2	1	228
Delfos 7343	478	436	409	436	304	413	177.16	38.6	1 1/32	227
Coker Staple	566	374	435	394	279	410	179.67	36.5	1 1/16	222

Cotton varieties, Newton, 1954.

	Pounds lint per acre	Total acre value			Lint percentage	Staple inches	Bolls per lb. lint
		Middling	Strict low middling	Low middling			
Fox	269.0	112.22	108.18	99.04	36.6	1 1/32	333
Auburn 56	257.7	106.75	102.75	93.48	35.2	1	305
Stoneville 2B	255.8	104.06	100.99	91.53	34.8	31/32	293
Bobshaw 1A	245.3	100.79	96.99	88.16	36.5	1	321
Coker Wilt	243.2	102.33	98.68	90.42	35.2	1 1/32	288
Stoneville 5A	241.9	98.32	94.57	85.86	38.4	1	297
Delfos 9169	238.5	99.67	96.09	87.98	36.3	1 1/32	297
Hi-Bred	227.1	84.50	81.55	76.33	40.2	7/8	248
Deltapine 15	223.7	89.07	86.38	78.11	38.3	31/32	305
Plains	223.5	89.83	87.15	78.88	36.7	31/32	293
Acala 4-42	216.2	89.27	86.03	78.68	38.4	1 1/32	230
Miller	212.0	85.05	81.34	74.13	36.0	15/16	286
Delfos 7343	206.5	84.50	81.30	73.86	37.2	1	329
Empire	194.4	80.22	77.21	70.21	35.8	1	275
Coker Staple	172.0	73.04	70.46	64.61	33.8	1 1/32	371
Louisiana 33	165.3	66.56	64.57	58.46	36.4	31/32	300

Average results from cotton varieties, Newton.

	Pounds lint per acre					Averages				
	1950	1951	1952	1953	1954	Lint	Acre values	Lint percentages	Length inches	Bolls per lb. lint
Bobshaw 1A	556	452	160	261	245	335	144.88	38.4	1	265
Fox	517	341	153	344	269	325	140.94	37.6	1 1/16	273
Hi-Bred	420	466	154	356	227	325	126.87	41.9	27/32	211
Stoneville 2B	518	411	168	269	256	324	142.54	37.2	1 1/32	231
Coker Wilt	510	401	166	297	243	323	141.82	37.2	1 1/32	239
Miller	496	412	151	296	212	313	133.67	37.6	15/16	239
Empire	577	336	164	283	194	311	135.67	38.8	1 1/32	217
Deltapine 15	529	331	137	318	224	308	131.81	40.5	1	248
Plains	518	318	164	276	224	300	130.14	38.0	1	253
Delfos 9169	474	367	155	243	238	295	131.02	37.3	1 1/16	239
Coker Staple	464	372	166	276	172	290	129.38	36.2	1 1/16	285
Delfos 7343	414	377	142	246	206	277	119.93	39.1	1 1/32	267

Flatwoods cotton variety test, 1954.

	Pounds lint per acre	Total acre value			Lint percentage	Staple inches	Bolls per lb. lint
		Middling	Strict low middling	Low middling			
Auburn 56	208.3	84.51	82.01	74.31	35.2	31/32	311
Plains	190.6	76.36	73.02	66.54	36.2	15/16	264
Empire	190.4	75.92	74.01	66.97	37.2	31/32	243
Louisiana 33	184.0	74.05	72.21	65.40	35.7	31/32	315
Miller	182.7	70.97	68.41	63.84	35.7	29/32	289
Stoneville 5A	181.0	69.51	66.98	62.45	37.5	29/32	286
Bobshaw 1A	179.1	72.08	68.95	62.86	35.5	15/16	333
Acala 4-42	171.7	67.36	65.65	59.29	40.1	31/32	222
Delfos 9169	169.9	70.03	67.40	61.28	36.0	1	265
Fox	169.0	69.37	67.35	61.09	33.5	31/32	402
Stoneville 2B	167.3	65.57	63.23	59.04	34.4	29/32	305
Hi-Bred	166.6	62.45	60.29	56.45	38.9	7/8	277
Coker Wilt	154.6	63.33	61.47	55.75	33.8	31/32	327
Delfos 7343	145.6	58.67	57.21	51.83	35.5	31/32	340
Deltapine 15	142.3	56.50	54.01	49.17	37.7	15/16	331
Coker Staple	139.4	58.58	56.42	51.40	33.1	1	373

Average results from Flatwoods cotton variety test.

	Pounds lint per acre			Averages				
	1952	1953	1954	Lint	Acre values	Lint percentage	Length inches	Bolls per lb. lint
Hi-Bred	388	392	167	316	116.14	40.4	27/32	215
Plains	355	352	191	299	121.36	37.1	31/32	222
Empire	324	381	190	298	120.69	38.5	1	190
Miller	308	389	183	293	117.09	36.5	15/32	227
Stoneville 2B	344	364	167	292	119.62	35.6	31/32	238
Fox	346	339	169	285	116.35	35.8	31/32	288
Bobshaw 1A	326	340	179	282	115.96	36.2	1	257
Delfos 9169	300	374	170	281	117.51	36.0	1 1/32	218
Coker Wilt	300	342	155	266	110.06	35.3	1	250
Delfos 7343	298	351	146	265	107.49	37.8	1	261
Deltapine 15	302	344	142	263	106.33	38.7	31/32	260
Coker Staple	288	360	139	262	109.89	35.0	1 1/32	271

Pontotoc Ridge cotton variety test, 1954.

	Pounds lint per acre	Total acre value			Lint percentage	Staple inches	Bolls per lb. lint
		Middling	Strict low middling	Low middling			
Stoneville 5A	251.3	99.40	96.38	87.08	39.5	31/32	250
Acala 4-42	249.1	100.29	96.43	87.46	40.2	1	207
Hi-Bred	242.6	88.23	85.80	80.95	40.4	27/32	221
Fox	241.1	101.01	97.39	89.19	35.9	1 1/32	310
Delfos 7343	239.9	95.57	92.69	83.81	38.2	31/32	270
Delfos 9169	233.9	96.40	92.78	84.36	36.0	1	245
Stoneville 2B	228.7	92.40	88.40	80.62	34.9	15/16	265
Miller	228.1	87.69	84.50	78.80	37.3	29/32	248
Empire	227.2	90.71	87.99	79.58	38.0	31/32	209
Auburn 56	221.0	88.49	84.62	77.11	36.3	15/16	265
Plains	221.0	88.77	86.12	77.95	36.8	31/32	259
Bobshaw 1A	218.4	88.50	85.88	77.80	35.4	31/32	299
Coker Wilt	203.2	82.49	80.06	72.54	35.1	31/32	262
Coker Staple	199.7	84.93	81.74	75.25	35.0	1 1/16	270
Louisiana 33	181.4	72.99	70.82	64.10	36.5	31/32	281
Deltapine 15	181.0	71.78	69.61	62.92	39.0	31/32	274

Average results from Pontotoc Ridge cotton variety test.

	Pounds lint per acre			Averages				
	1952	1953	1954	Lint	Acre values	Lint percentage	Length inches	Bolls per lb. lint
Hi-Bred	300	382	243	308	114.06	40.9	7/32	192
Empire	292	375	227	298	119.96	38.3	31/32	180
Fox	292	337	241	290	119.19	36.3	1	263
Delfos 7343	292	337	240	290	117.54	38.1	1	243
Plains	283	355	221	286	115.95	37.0	31/32	220
Bobshaw 1A	284	352	218	285	116.12	36.3	1	249
Miller	280	343	228	284	111.77	36.8	29/32	219
Delfos 9169	269	344	234	282	117.51	35.7	1 1/32	216
Stoneville 2B	260	334	229	274	112.34	35.1	31/32	227
Deltapine 15	312	313	181	269	108.28	38.9	31/32	240
Coker Staple	265	336	200	267	112.71	35.0	1 1/16	242
Coker Wilt	256	318	203	259	106.94	35.1	1	235

BULLETIN 526 JANUARY 1955

1950-54 Yazoo-Mississippi Delta

COTTON VARIETY TESTS

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

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1950-54 COTTON VARIETY TEST
Yazoo-Mississippi Delta

By JAMES B. DICK and ZANE F. LUND[1]

Since its establishment in 1904 the Delta Station has continuously conducted cotton variety tests on the Station at Stoneville and on plantations in representative sections of the Yazoo-Mississippi alluvial area in cooperation with county agents and Delta farmers. These studies over the last half century have served to determine which varieties were best adapted to the area in production and in money-value-per-acre under average conditions and under the changing economy of the Delta. Hundreds of varieties have been impartially tested in the many variety studies conducted, and the information obtained and published on them annually in Mississippi Farm Research and Service sheets has been invaluable to Delta farmers.

Changing economic conditions and consumer demand, and improved spinning machinery and methods have caused a gradual shift in production of Delta cotton from the fine, long-staple varieties to varieties of 1 1/16 to 1 5/32 inch staple. Short cotton has never been produced to advantage in the alluvial section of Mississippi and present demand, price range, labor conditions, and climatic hazards prohibit the extensive planting of extra long staple varieties which produce less and reqquire special handling. Many varieties and new strains ot cotton are studied each year at the Delta Station in strains tests, but the "standard variety trials conducted throughout the Delta include only a limited number of current strains of commercial varieties of cotton which are best adapted to and commonly grown in the area or which are of special interest.

This report summarizes the results of the cotton variety tests which have been conducted on sandy loam soils during the 5-year period 1950-1954. Results are reported by locations in tables 1 through 8. Tables 9 and 10 summarize data on such varietal characteristics as gin turnout, fiber properties, and seed grade for the five years and all locations. Data reported include yield of seed cotton and lint, gin turn-out, staple length, boll size, earliness or percent harvested at first picking, fiber tensile strength, and money value per acre.

Although the variety trials must of necessity be conducted on a limited plot basis, every effort is made to have them represent actual plantation production practices. All plots were randomized and replicated several times and the data were based on harvested weights from all plots at each location. Gin turn out, staple lengths, fiber properties and seed grade were determined from a sufficient number of 100-boll samples at Stoneville and 2-pound samples at other locations to provide valid information.

Classing was done by the staple Cotton Cooperative Association, Greenwood, Mississippi and by the Greenwood office of the Agricultural Marketing Service, United States Department of Agriculture.

Fiber properties of upper half mean (U. H. M.), tensile strength, length uniformity and fineness were determined by the Knoxville laboratory of the Cotton and Other Fiber Crops Section, A. R. S., U. S. Department of Agriculture. Strength determined by the Pressly breaker, is given in 1,000 pounds per square inch of cellulose. Fiber uniformity is the ratio between the mean fiber length and the upper half mean and gives an idea of the uniformity of the length of fibers in the sample. Strength and elongation determinations made on the Stelometer, a relatively new instrument, for the 1954 tests are not given in this report.

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[1] Agronomist and Associate Breeder, respectively. This report is based upon results from cooperative research conducted by the Mississippi Agricultural Experiment Station and Field Crops Research Branch, Agricultural Research Service, United States Department of Agriculture.

Table 1. Yield and other data from cotton variety test at Stoneville, 1954.

Variety	Yield per acre		Waste	Gin turn-out	Staple length	Bolls per lb.		Fiber tensile strength	Total money value per acre		
	Seed cotton	Lint				Seed cotton	Lint		M	SLM	LM
	Lbs.	Lbs.	Pct.	Pct.	1/32 in.	Bolls	Bolls	1000 lbs.	Dols.	Dols.	Dols.
Delfos 9169	1290	443	0.8	34.4	34.8	76	220	81.5	$191	$184	$169
Coker 100 Staple	1273	428	2.0	33.7	35.0	84	250	89.4	186	179	164
DES 7343	1193	428	0.6	35.8	34.4	90	254	82.3	182	175	161
Empire	1216	432	2.6	35.6	33.3	66	186	88.3	182	175	161
Fox	1149	417	6.7	36.6	33.5	97	265	82.0	175	169	155
Stoneville 2B	1208	400	2.0	33.1	33.4	77	232	81.5	171	165	152
Stoneville 3202	1106	402	1.5	36.4	33.4	84	230	73.9	169	162	149
Deltapine 15	970	372	2.0	38.4	33.6	94	244	85.1	155	149	137
Coker 51-55	1016	340	5.6	33.3	34.8	83	250	87.9	147	141	130
Coker 100 Wilt	1018	335	6.7	32.9	34.5	82	250	86.2	145	140	129
Bobshaw 1A	1018	328	3.4	32.4	33.8	93	288	93.1	141	137	126
Wilds	910	272	0.6	29.8	40.3	95	320	94.7	148	132	110
L.S.D. 5%	152	54									
L.S.D. 1%	203	70									

Note—Test planted April 20, harvested September 8. No second picking.

The money values per acre were based upon: (1) Yields of lint and of seed, (2) classers staple length, and (3) seed grades. The average Memphis prices for cotton lint of the respective grades and staple lengths for 10 weeks of each marketing season were used. Seed were evaluated on a basis of average price per ton each season, with premiums and discounts in accordance with U. S. Department of Agriculture standards. Seed analysis were made in the Stoneville laboratory of the Cotton Division, A. M. S., U. S. Department of Agriculture.

Of the 5-year period the last three years, 1952, 1953, and 1954 have been abnormally dry years with unusually high temperatures during the production months. This condition has interferred considerably with normal development and fruiting of the cotton plants and in many instances has reduced yields and adversely affected expression of varietal characteristics.

The variety trials from 1950 to 1952 embraced 12 varieties, four of which were considered new developments. Wherever possible averages are given for the 3-year priod 1950-1952. In 1953 two varieties, Arkot and Miller, were dropped and Stoneville 3202 was added, making it possible to report on only nine varieties for the long-time averages which included 1953 or 1954. In tables 1 through 8 the varieties are arranged according to the average of the money value-per-acre for Middling, Strict Low Middling, and Low Middling grades. In tables 9 and 10 the varieties are arranged alphabetically.

Stoneville Tests

Table 1 presents the results of the cotton variety trial at Stoneville in 1954 as a progress report. Excessively high temperatures with no rainfall from June 10 to August 20 cut production an estimated 50 percent and caused considerable premature opening. After light rains and wind on August 22nd some wastage had occurred. This cotton was picked up, dried, cleaned and weighed and the percentage of waste to total production is shown in column 3 of Table 1.

Table 2 gives average results for 11 varieties for two years, 1950 and 1952. Poor stands in 1951 invalidated the data for the Stoneville variety test. These tests included the Arkot and Miller varieties which were not included in 1953 and 1954, and also the new Fox and Bobshaw 1A varieties and the Delta Station new strain of Delfos, DES 7343. Table 3 gives average results for the nine varieties which were included in all tests from 1950 through 1954. Table 4 gives the average results of the 1953 and 1954 tests

Table 2. Yield and other data from 11 varieties, Stoneville cotton variety tests, average 2-years—1950 and 1952.

Variety	Yield per acre		Gin turn-out	Staple length	Bolls per pound S.C.	Percent picked first picking	Fiber tensile strength per sq. in.	Total money value per acre		
	Seed cotton	Lint						M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Bolls	Pct.	1000 lbs.	Dols.	Dols.	Dols.
Fox	2160	782	35.4	34.0	79	69	76.6	$373	$354	$332
Delfos 9169	2114	738	35.0	34.0	67	50	75.8	356	338	317
Bobshaw 1A	2070	740	35.0	34.0	78	57	85.8	356	338	317
Empire	2000	726	36.4	33.5	60	62	82.9	346	328	308
Deltapine 15	1900	732	38.4	34.0	77	65	76.9	344	327	306
Arkot	2048	705	34.6	34.0	70	66	78.0	342	324	304
DES 7343	1876	720	34.8	34.0	81	66	75.3	340	322	302
Stoneville 2B	1994	694	34.8	34.5	69	56	81.4	336	318	299
Coker 100 Wilt	1938	684	35.3	35.0	71	55	81.2	336	317	294
Miller	1923	703	36.4	32.0	66	72	80.2	330	314	295
Wilds	1608	508	31.8	38.5	76	59	88.3	295	265	228
L.S.D. 5%		73								
L.S.D. 1%		97								

Table 3. Yield and other data—from 9 varieties, cotton variety tests, Stoneville, average 4 years—1950, 1952, 1953, 1954.

Variety	Yield per acre		Gin turn-out	Staple length	Bolls per pound S.C.	Percent picked first picking [1]	Fiber tensile strength per sq. in.	Total money value per acre		
	Seed cotton	Lint						M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Bolls	Pct.	1000 lbs.	Dols.	Dols.	Dols.
Empire	2080	740	35.8	33.5	60	60	82.7	$327	$313	$292
Delfos 9169	2022	724	34.3	34.5	69	48	76.9	326	313	291
Fox	2002	714	35.9	34.0	83	66	77.2	319	306	285
DES 7343	1924	719	37.3	34.0	82	59	76.1	315	302	282
Stoneville 2B	2058	700	34.0	34.0	70	49	79.7	314	301	280
Deltapine 15	1868	714	38.2	34.0	80	57	78.3	311	298	278
Bobshaw 1A	1930	675	34.3	34.0	80	53	86.0	303	290	271
Coker 100 Wilt	1890	650	34.3	34.8	73	52	81.0	296	282	262
Wilds	1673	512	30.8	39.0	79	50	89.3	282	253	216
L.S.D 5%		54								
L.S.D 1%		71								

[1] Earliness for data for 3 years only—1950, 1952 and 1953.

Table 4. Yield and other data from 11 varieties, cotton variety tests, Stoneville, average 2 years—1953 and 1954.

Variety	Yield per acre		Gin turn-out	Staple length	Bolls per pound S.C.	Percent picked first picking [1]	Fiber tensile strength per sq. in.	Total money value per acre		
	Seed cotton	Lint						M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Bolls	Pct.	1000 lbs.	Dols.	Dols.	Dols.
Empire	2160	752	35.1	33.5	61	57	82.5	$307	$298	$276
Delfos 9169	2130	709	33.6	35.0	70	45	78.0	295	288	265
Stoneville 2B	2120	707	33.2	33.5	68	36	78.0	291	283	262
DES 7343	1970	717	36.2	34.0	83	46	77.0	290	282	260
Deltapine 15	1832	696	38.1	34.0	84	42	79.7	278	270	249
Coker 100 Staple	1978	653	33.2	35.0	80	45	84.5	274	266	245
Stoneville 3202	1880	676	36.1	33.5	79	51	71.0	272	264	245
Fox	1844	646	35.5	34.0	87	59	77.7	264	257	237
Coker 100 Wilt	1842	616	33.3	34.5	76	45	80.8	254	248	230
Bobshaw 1A	1790	611	33.6	34.0	84	44	86.6	250	244	225
Wilds	1738	517	29.8	39.5	82	32	90.3	270	240	203
L.S.D 5%		134								
L.S.D 1%		178								

[1] Earliness data from 1953 only.

for 11 varieties, including Stoneville 3202. The average yield for the 1953 test was 987 pounds and for the 1954 test (see table 1) was 383 pounds.

Cokers Wilds is the only 1 3/16 to 1 1/14 inch extra-staple variety which has been consistently offered for sale during the 5-year period covered by this report. Wilds was included in all Delta tests in 1950, 1951 and 1952 and in the Stoneville trials in 1953 and 1954 for comparative purposes. A 5-year yield comparision between Wilds and the average of seven medium-staple varieties most commonly grown in the Delta shows a 41 percent increase of the 7-variety average over Wilds. In value per acre the increase was $42.00 per acre or 13 percent for Middling grade and $56.00 or 20 percent for Strict Low Middling. Low grade extra staple length cotton brings little or no premium over the low grade medium staple varieties.

Tunica Variety Tests

Table 5 presents data for the variety trials conducted in 1950 and 1951 on the plantation of Mr. Wesley Bailey several miles west of Tunica. No successful tests have been conducted in the Tunica area on sandy loam since 1951. A variety trial conducted on buckshot southeast of Tunica was reported in the January 1953 issue of Mississippi Farm Research.

Money Variety Tests

Table 6 presents the averages for cotton varieties in three variety tests, 1950. 1951 and 1952, conducted on Wildwood Plantation, Mr. Hugh Gary operator, several miles southwest of Money, Mississippi. The test area is on the banks of the Tallahatchie River and the loam soil is typical of the lower Tallahatchie basin. The 1953 variety trial on Wildwood was not harvested for yield because of irregular stands, and the 1954 data are not included in this summary because irregular stands necessitated heavy spot planting which grew off unevenly under the unusual climatic conditions which existed throughout the growing season.

Table 5. Yield and other data from 12 varieties, cotton variety tests, Tunica, average 2 years—1950 and 1951.

Variety	Yield per acre		Gin turn out	Staple length	Percent picked first picking	Fiber tensile strength per. sq. in.	Total money value per acre		
	Seed cotton	Lint					M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Pct.	1000 lbs.	Dols.	Dols.	Dols.
Fox	2304	822	35.7	34.0	66	72.5	$376	$357	$336
Empire	2200	790	36.1	34.5	68	74.9	366	346	326
Bobshaw 1A	2146	782	36.6	34.0	62	78.2	358	339	320
Arkot	2236	756	33.9	35.0	63	70.9	355	337	316
Coker 100 Staple	2152	750	35.0	35.5	65	73.4	352	333	310
DES 7343	2006	768	38.3	34.0	67	68.1	348	330	310
Delfos 9169	2135	752	35.3	35.0	56	69.3	347	329	309
Coker 100 Wilt	2128	750	35.3	34.5	60	71.7	346	328	308
Deltapine 15	1975	764	38.8	34.5	61	71.9	345	327	307
Miller	2062	760	37.0	32.5	66	73.4	342	326	308
Stoneville 2B	2064	736	35.6	34.0	66	76.1	336	320	302
Wilds	1656	520	31.5	40.0	60	79.7	302	270	224
L.S.D 5%		64							
L.S.D 1%		85							

Table 6. Yield and other data from 12 varieties, cotton variety tests, Money, average 3 years—1950-1952.

Variety	Yield per acre		Gin turn out	Staple length	Percent picked first picking	Fiber tensile strength per. sq. in.	Total money value per acre		
	Seed cotton	Lint					M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Pct.	1000 lbs.	Dols.	Dols.	Dols.
DES 7343	2250	953	37.4	34.3	66	66.3	$436	$415	$389
Delfos 9169	2618	892	34.1	34.3	62	69.1	418	400	372
Bobshaw 1A	2500	897	36.0	33.7	64	75.8	412	393	369
Deltapine 15	2360	910	38.6	34.0	63	70.4	412	392	367
Fox	2490	894	35.9	34.0	68	70.3	410	391	367
Empire	2433	840	34.8	33.7	61	75.6	390	372	350
Miller	2372	854	36.1	32.3	66	69.1	386	370	347
Coker 100 Wilt	2446	830	34.1	34.3	61	70.8	385	367	344
Stoneville 2B	2350	820	34.8	34.0	64	74.0	379	362	339
Arkot	2372	797	33.7	34.3	64	71.5	375	358	335
Wilds	2136	655	30.7	39.0	61	79.5	371	337	286
Coker 100 Staple	2080	707	34.1	34.7	58	71.7	332	316	296
L.S.D 5%		72							
L.S.D 1%		95							

Table 7. Yield and other data from 12 varieties, Yazoo City cotton variety tests. average 3 years, 1950-1952.

Variety	Yield per acre		Gin turn out	Staple length	Bolls[1] per pound S.C.	Percent[2] picked first picking	Fiber[2] tensile strength	Total money value per acre		
	Seed cotton	Lint						M	SLM	LM
	Lbs.	Lbs.	Pct.	1/32 in.	Bolls	Pct.	1000 lbs.	Dols.	Dols.	Dols.
Deltapine 15	2073	820	39.6	33.7	79	36	76.4	$367	$349	$328
Fox	2190	803	36.7	33.7	80	38	74.5	367	347	326
Arkot	2264	780	34.6	34.0	70	44	76.5	362	345	324
Bobshaw 1A	2196	784	35.8	33.3	80	32	82.6	360	343	323
DES 7343	2074	790	38.0	34.0	80	36	73.2	355	338	318
Delfos 9169	2210	762	34.7	34.3	70	30	71.3	353	337	317
Coker 100 Wilt	2192	750	34.4	34.3	72	30	77.9	346	330	310
Stoneville 2B	2102	748	35.5	33.7	69	30	79.7	342	326	307
Coker 100 Staple	2104	728	34.7	34.3	78	30	77.5	338	322	302
Miller	2038	740	36.4	33.0	71	44	78.2	336	319	302
Empire	2058	727	35.7	33.7	61	34	81.6	334	318	299
Wilds	1675	520	31.4	39.0	77	30	85.8	297	267	224
L.S.D 5%		71								
L.S.D 1%		94								

[1] Data for 1951 only.

[2] Data for 1950 and 1951 only.

Table 8. Yield and other data from 9 varieties, Yazoo City cotton variety tests, average 4 years—1950-1953.

Variety	Yield per acre		Gin turnout	Staple length	Total money value per acre		
	Seed cotton	Lint			M	SLM	M
	Lbs.	Lbs.	Pct.	1/32 in.	Dols.	Dols.	Dols.
Fox	2090	762	36.6	33.5	$336	$322	$302
DES 7343	1972	746	37.9	34.0	326	312	293
Bobshaw 1A	2030	728	36.0	33.2	325	311	292
Deltapine 15	1883	745	39.5	33.8	325	311	291
Delfos 9169	2080	720	34.9	34.2	324	310	291
Coker 100 Wilt	2050	707	34.6	34.2	318	304	285
Stoneville 2B	1980	704	35.5	33.8	313	300	282
Empire	1984	702	35.8	33.8	312	300	280
Coker 100 Staple	2000	690	34.6	34.2	311	298	279

Significant difference. None.

Yazoo City Tests

Table 7 presents average results of the cotton variety trials conducted on the plantation of Mr. Emile Schaeffer near Yazoo City for the three years 1950, 1951 and 1952. This plantation is on the banks of the Yazoo River just north of Yazoo City, and the test was on an excellent type of sandy loam soil. Twelve varieties were included in these tests. Table 8 gives the averages for 9 varieties in 4 trials for the 4-year period 1950-1953. The 1954 variety trial at this location was irrigated somewhat irregularly and the results are not being used in this report.

Lint Percent, Classer's Staple Length, Upper Half Mean, Fiber Tensile Strength and Earliness

Table 9 gives a summary of several varietal characteristics of all the varieties included in the Delta cotton variety tests during the period from 1950 to 1954. The expression of these characteristics is more or less affected by seasonal production conditions, but the changes are generally found to be relative.

Lint percent or gin turnout is a very important factor to the farmer and is considered carefully in the selection of a variety to plant. Of the 12 varieties included in the 7 tests in 1950, 1951 and

Table 9. Lint percent, classer's staple length, upper half mean length. fiber tensile strength, and percent harvested at first picking for all varieties included in the Delta cotton variety tests during the 5-year period 1950-1954.

Variety	Lint percent		Classers's staple length		Upper half mean		Fiber tensile strength		Earliness	
	12 varieties 10 tests[1] 1950-1952	9 varieties 15 tests[2] 1950-1954	12 varieties 10 tests[1] 1950-1952	9 varieties 15 tests[2] 1950-1954	12 varieties 7 tests[3] 1950-1951	10 varieties 4 tests[4] 1953-1954	12 varieties 7 tests[3] 1950-1951	10 varieties 4 tests[4] 1953-1954	12 varieties 8 tests[5] 1950-1952	Stoneville test 1953
	Percent	Percent	1/32 inches	1/32 inches	inches	inches	1000 lbs.	1000 lbs.	Percent	Percent
Arkot	34.2		34.3	----	1.11	----	72.9	----	59	----
Bobshaw 1A	35.8	35.5	33.7	33.7	1.05	1.06	78.6	87.2	54	44
Coker 100 Staple	34.6	34.2	34.8	34.8	1.14	1.16	74.6	84.0	50	45
Coker 100 Wilt	34.7	34.4	34.5	34.4	1.13	1.11	73.4	81.2	52	45
DES 7343	38.0	37.5	34.1	34.1	1.09	1.09	68.9	76.8	59	46
Delfos 9169	34.7	34.4	34.4	34.5	1.14	1.13	69.6	77.5	50	45
Deltapine 15	38.9	38.8	34.0	33.9	1.09	1.08	72.4	78.7	57	42
Empire	35.7	35.4	33.8	33.7	1.09	1.08	77.2	83.7	56	57
Fox	36.2	36.1	33.9	33.7	1.10	1.09	72.0	75.8	60	59
Miller	36.4		32.5	----	.98	----	73.0	----	62	----
Stoneville 2B	35.2	34.9	34.0	33.9	1.10	1.06	76.4	75.0	54	36
Wilds	31.3	--	39.1	--	1.30	----	81.6	----	53	32
Stoneville 3202	----	----	----	----	----	1.05	----	72.3	----	51

[1] Includes Stoneville 1950 and 1952; Tunica 1950 and 1951 and Money tests for 1950, 1951, 1952; Yazoo City for 1950, 1951 and 1952.

[2] Includes above tests and Stoneville and Yazoo City tests for 1953 and 1954, and Money test for 1954.

[3] Includes tests at Stoneville 1950, and at Tunica, Money and Yazoo City in 1950 and 1951.

[4] Data from Stoneville 1953 tests and Stoneville, Money and Yazoo City 1954 tests.

[5] Data from tests at Stoneville in 1950 and 1952, Tunica in 1951, Money in 1950, 1951 and 1952, and Yazoo City in 1950 and 1951.

1952, the average lint percent of Deltapine 15 was highest with 38.9 percent. The Wilds extra staple variety was lowest with 31.3 percent. For the 5-year average Deltapine 15 had a 38.8 percent lint average. The other medium staple length varieties had gin turnouts from 34.2 to 37.5 percent.

Practically all of the Delta cotton crop is now grown from varieties which produce a staple length of 1 1/16 to 1 1/8 inches under normal conditions. In abnormally dry seasons of high temperatures the staple is sometimes reduced 1/32 to 1/16 inches and in seasons with sufficient rainfall in July and August the staple length is sometimes lengthened slightly. In isolated instances the staple length of a variety may be so affected by soil and climatic conditions that it is considerably shorter or longer than expected. Such a condition would in no way affect the germ plasm of the seed, and the normal staple length may be expected if they are planted the following year. Average staple lengths are shown in the second section of Table 9.

The upper half mean length, as given in the third section of Table 9, is the mean length of the fiber in the upper half of the sample as measured by the fibrograph machine, and is generally comparable to the classer's staple length. This is a more accurate actual measurement of the fiber length which is not affected by the intangible "feel" or "character" which sometimes influences the classer's staple length on which cotton is bought and sold. In classer's staple length and upper half mean the varietal fiber length of Wilds approaches 1 1/4 inches while the Miller short staple variety is only one inch long. The other varieties are between these two, as shown.

Fiber tensile strength is directly related to yarn strength and has been of increasing importance to textile manufacturers over the last 20 years. Many of these now have fiber laboratories or employ commercial laboratories for determination of fiber properties. Strength, as reported in Table 9, was determined by the Pressly breaking machine and is given in 1000 pounds per square inch. The average tensile strength of the 12 varieties tested in 1950 and 1951 ranged from 81,600 pounds for Wilds to 68,900 for DES 7343. In the 1953-1954 averages Bobshaw was highest with 87,200 pounds and Stoneville 3202 lowest with 72,300 pounds. Fiber strength is affected by seasonal conditions. Strength in the "wet

Table 10. Percent oil and ammonia, and grade index for all varieties in 13 Delta cotton variety trials during the 5-year period 1950-1954.

	Oil content		Ammonia content		Grade index	
Variety	12 varieties 7 tests[1] 1950-1951	10 varieties 4 tests[2] 1953-1954	12 varieties 7 tests[1] 1950-1951	10 varieties 4 tests[2] 1953-1954	12 varieties 7 tests[1] 1950-1951	10 varieties 4 tests[2] 1953-1954
	Percent	Percent	Percent	Percent	Index	Index
Arkot	18.9		3.60		102.1	
Bobshaw 1A	18.5	17.6	3.76	4.33	101.5	101.3
Coker 100 Staple	18.6	17.5	3.76	4.41	101.9	101.3
Coker 100 Wilt	18.1	16.6	3.74	4.38	100.0	97.3
DES 7343	18.4	17.4	3.86	4.44	101.7	100.8
Delfos 9169	19.8	18.4	3.83	4.35	106.2	104.8
Deltapine 15	17.7	16.6	3.89	4.43	99.2	97.6
Empire	19.7	18.1	3.87	4.42	107.0	103.7
Fox	17.6	16.3	3.58	4.26	97.0	95.1
Miller	18.2		3.78		100.6	
Stoneville 2B	18.8	17.9	3.72	4.29	102.6	102.7
Wilds	18.8		3.92		104.0	
Stoneville 3202		17.9		4.36		102.7

[1] Stoneville in 1950, Tunica, Money and Yazoo City in 1950 and 1952.

[2] Stoneville in 1953 and 1954, Money and Yazoo City in 1954.

years" 1950 and 1951 was much lower than in the dry years 1953 and 1954.

Fineness or coarseness of fiber is also very important to the textile industry. Fineness determinations made for the varieties in several tests on the arealometer are not included in this report.

Earliness of a variety is of great interest to producers but is difficult to measure and is at best but relative. In the cotton variety trials earliness has been measured by the percent of the total yield which was harvested at the first picking. Efforts were made to make the first picking when the cotton was 40 to 60 percent open, but this has not always been possible and in several variety tests no earliness data was obtained. The last section of Table 9 gives the average of 8 tests in 1950, 1951 and 1952 for 12 varieties, and for the Stoneville test in 1953. Opening of cotton has been found to be fairly closely correlated to earliness and rate of blooming under normal conditions of temperature and rainfall. Bloom counts in the Stoneville variety tests indicate that Fox and Empire have a more rapid rate of blooming for the first four weeks than the other varieties. This is reflected in the earlier maturity and percent harvested at first picking.

Oil and Ammonia Content and Seed Grade

Although cotton seed are generally thought of as a by-product in cotton production, in reality it ranks among the first ten crops as a source of agricultural income in the United States. From a surplus waste product worth less than twenty-five cents a bushel 50 years ago, cottonseed has become one of the most important sources of fat as well as a valuable protein concentrate feed for poultry and livestock, currently selling for $70.00 a ton.

Oil mills purchase cotton seed on the basis of grade, which is based upon the percentage of foreign matter, the moisture content of the seed, the amount and quality of oil, and the amount of ammonia or protein contained in the seed. The oil quality depends on the amount of free fatty acid in the seed, which in turn is the result of weather damage or heating in storage.

The percentage of oil and ammonia in cotton seed are varietal characters which definitely affect the milling value of seed. Climatic conditions, location and season influence grades, but as a rule the grade differentials between varieties in given variety trials are relatively the same.

Table 10 gives the oil content, ammonia content, and seed grades for all the varieties in 11 Delta variety tests for the 5-year period 1950-1954. Seed samples for analysis were field samples which contained very little free fatty acid. Analysis was calculated at 12 percent moisture so the final grade is based on the oil and ammonia content. Averages for 12 varieties for 7 tests 1950-1951 are shown in the first column under each heading and averages for 10 varieties for 4 tests 1953-1954 are shown in the second column. Seed analysis were not made for the other tests. Grade index for the varieties ranged from 97 to 106 in the averages for the seven 1950-1951 tests, and from 95.1 to 104.8 in the 2-year average. This difference of nine index points between varieties would amount to $6.50 for prime seed at $70.00 a ton basis.

BULLETIN 527 JANUARY 1955

Corn Hybrids And Varieties

1954 Tests In Mississippi

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

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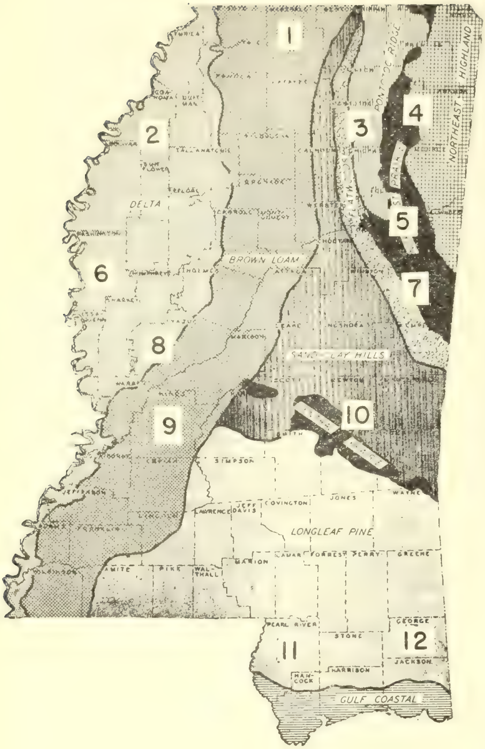

COOPERATIVE PROJECT

These corn tests are a cooperative project between the Mississippi Experiment Station and the Agricultural Research Service, U. S. Department of Agriculture. This map shows the test locations.

Project leader is Robert C. Eckhardt, agronomist, U.S.D.A., and Mississippi Experiment Station. Associated with him are:

H. D. Bunch, Experiment Station; W. A. Douglas, and C. A. Henderson, entomologists, U.S.D.A. at State College (location 5 on the map.)

S. P. Crockett (1), North Mississippi Branch Station, Holly Springs; B. C. Hurt (3), Pontotoc Ridge-Flatwoods Branch Station, Pontotoc; Robert Albritton (4), Northeast Mississippi Branch Station, Verona; Donald H. Bowman (6), Delta Branch Station, Stoneville; Louie Walton (7), Black Belt Branch Station, Brooksville; R. E. Coats (9), Brown Loam Branch Station, Raymond; K. C. Freeman and B. C. Murphy (10), Coastal Plain Branch Station, Newton; T. E. Ashley (11), South Mississippi Branch Station, Poplarville.

The plantation trials were made possible through the cooperation of Harris Barnes, Jr. (2), Connell Planting Company, Sherard; E. T. Shaffer (8), Yazoo City; Dwan Rouse (12), Lucedale, Mississippi.

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Corn Hybrids And Varieties --- 1954 Tests

Tests comparing different hybrids and varieties were conducted at twelve different locations in Mississippi in 1954. Because of the severe heat and lack of rainfall, tests at Holly Springs, Pontotoc (2 tests) and Clarksdale were failures and not harvested. The test at Raymond was very poor but harvested. Satisfactory to excellent tests were harvested at eight locations.

The best guide to the desirability of a hybrid is its performance over a period of years. Based on their performance in 1954 as well as in past years, the following hybrids are recommended for Mississippi:

North Mississippi (North of U. S. Highway 82): Dixie 22 (yellow), Dixie 33, Dixie 17, Funk 779W, Pfister (P.A.G.) 631 and Tenn. 29 (all white).

Central Mississippi (North of U. S. Highway 80, South of U. S. Highway 82): Coker 811 (white), Coker 911 (white), Dixie 11 (white), Dixie 18 (yellow), Funk G 785W (white), Dixie 82 (yellow), and Pfister (P.A.G.) 486 (yellow).

(For early feed or early hogging off, use hybrids recommended for North Mississippi.)

South Mississippi (South of U. S. Highway 80): Dixie 18 (yellow), Coker 811 (white), and La. 521 (white).

The availability of planting seed has been considered in these recommendations; this automatically keeps an experimental hybrid from the list.

Explanation of Tables

The state was divided into 3 sections, North Mississippi, Central Mississippi, and South Mississippi. Holly Springs, Pontotoc, Verona, State College and Stoneville were placed in the northern section; Brooksville, Newton, Raymond and Yazoo City in the central section; Poplarville and Lucedale in the southern section. Within a section most entries were the same. The placing of corn hybrids in one of the sections was done on the recommendation of the breeder. The tests in the northern and central sections were balanced lattices with six replications. The tests at Poplarville and Lucedale in South Mississippi were randomized blocks with five replications.

Each plot was two rows wide and ten hills long with rows and hills 40 inches apart (42 at Brooksville and Poplarville, and 38 at Yazoo City).

Five seeds were planted per hill and thinned to two or three plants. Tests at Holly Springs, Pontotoc, Newton, Raymond and Poplarville were thinned to two stalks per hill which with a perfect stand resulted in about 7800 plants per acre. Tests at State College, Stoneville, Brooksville, Yazoo City, Verona, and Lucedale, were thinned to three plants per hill which resulted in a perfect stand of about 12,000 plants per acre.

The percentage of plants lodged is based on actual counts. All plants broken below the top ear-bearing node (joint) were classified as stalk lodged while all plants leaning 30 degrees or more were root lodged.

Ears infested with rice weevil and corn earworms are shown as percent. Rice weevil damage was so slight that a measure of resistance could be obtained only at Lucedale. Data on earworm infestation are reported from eight locations. Ear height is reported as the distance in feet from the ground to the point where the top ear is attached to the plant. Ears per plant indicate whether the hybrid is one-eared or prolific; it is obtained by dividing the number of ears harvested by the total number of plants. Husk length is reported in the number of inches that the husk extends beyond the tip of the ear.

No hybrid is recommended on the basis of one year's test; testing for at least two years is necessary for recommendation.

North Mississippi

The tests at Verona, Stoneville, and State College were all high in yield in 1954 and in 1953. The best hybrids yielded about 50% more than the poorer hybrids and varieties. Tenn. 29, a new white hybrid, is excellent in yield and lodging resistance. However, little seed will be available for planting in the spring of 1955.

Funk G 799 W, Dixie 33 and Dixie 17 are white hybrids excellent in yield. Dixie 17 has good quality grain but lodges badly. Pfister (P.A.G.) 631 is a high yielding, low eared hybrid with a large ear of only fair quality grain. Dixie 33 stands well and has a high yield of grain; the quality of grain is better than P.A.G. 631, but poorer than Dixie 17.

Pioneer 309A was tested for the first time in 1954 and appears promising. It has a large yellow ear with low placement, but the grain is not of high quality. It has a good record for resistance to lodging.

Pfister (P.A.G.) 653 was tested for the first time in 1954 and appears promising. Pfister (P.A.G.) 655 was erratic in performance in 1954 and in 1953. It yielded well at Verona and State College, but poorly at Stoneville in both years.

Central Mississippi

Resistance to the rice weevil is of minor importance in North Mississippi, but becomes increasingly important the farther south corn is grown. The hybrids recommended for North Mississippi yield well in Central Mississippi but lack husk protection against the weevil. The hybrids recommended for cribbing in the Central area have a longer, tighter husk than those adapted to North Mississippi.

Funk G785W, Dixie 11 and Coker 911 are three white hybrids with good grain quality and yield. They possess moderate resistance to the rice weevil and can be grown where damage by weevils is not too severe. Dixie 82 is a yellow hybrid with moderate resistance to rice weevil.

Dixie 18 (yellow) and Coker 811 (white) are two hybrids with excellent husks and resistance to rice weevil. Both hybrids are resistant to lodging and corn earworm damage to the ear. Dixie 18 has a high ear placement on fertile soil while Coker 811 has a much lower placement. They should be grown where rice weevils are abundant.

Pfister (P.A.G.) 486 is a yellow hybrid that has a good record over the three year period 1952-1954. The ear placement is low and the stalks stand well. The husk tightness grade indicates that the hybrid should be grown in areas where the rice weevils are not serious.

South Mississippi

In addition to the test regularly conducted at Poplarville, a test was located at Lucedale in George County. Both tests were damaged by drought, but produced satisfactory yields. The highest yielding entry was an experimental Mississippi hybrid, Miss. 1125. This hybrid has a very large ear, stands well and is resistant to the corn earworm. It is high eared when grown on rich bottom soil.

On the basis of tests over a period of years, Dixie 18, a yellow hybrid, Coker 811 and La. 521, white hybrids, can be recommended because of their resistance to the rice weevil. Dixie 18 and Coker 811 are resistant to lodging and Coker 811 is also low eared.

McCurdy 1003 was tested for the first time and appears to be similar in characteristics to Dixie 18. The grain is excellent in quality.

Average of data from hybrid corn tests grown at Verona, State College and Stoneville, Miss., 1954.

Pedigree	Acre yield	3-year average yield 1952-54	Plants erect at harvest	Lodging		Ears infested	Ear ht.	Ears per plant	Husk		Shelling	Stand
				Root	Stalk	Earworm			Length	Tightness		
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade[1]	%	%
Tenn. 29	72.4	65.6	89	7	4	99	3.9	1.1	2.0	1.8	82.0	99
Miss. 1123*	71.9	66.6	80	11	9	96	4.6	1.3	3.0	2.2	80.9	98
Funk G779W	71.3	63.1	64	30	6	99	4.0	1.1	1.2	1.4	82.9	98
Dixie 22	70.6	64.1	67	24	9	99	4.6	1.2	2.3	1.6	81.1	96
Dixie 17	70.2	62.5	50	29	21	99	4.4	1.3	2.6	2.0	83.6	97
Dixie 82	67.1	61.4	69	23	8	96	4.8	1.3	3.0	2.4	79.4	98
Pfister (P.A.G.) 631	66.6	59.5	65	21	14	100	3.4	1.0	1.9	1.8	79.8	96
Pfister (P.A.G.) 653	66.5	...	72	23	5	97	3.7	1.2	2.4	2.0	81.4	97
Dixie 33	65.8	62.7	64	27	9	100	4.5	1.1	2.0	1.9	82.6	98
Pioneer 309A	64.5	...	87	6	7	100	3.6	0.9	2.0	2.1	84.5	98
Dixie 11	63.5	61.3	48	35	17	94	4.5	1.3	2.5	1.9	83.9	99
Miss. 3226*	61.7	......	81	14	5	97	4.1	1.2	3.6	2.6	79.3	97
Broadbent 337W	61.7	......	59	20	21	100	3.3	0.9	2.1	1.8	79.9	95
Tenn. 90	61.1	......	79	12	9	100	4.1	0.9	2.4	1.8	81.7	98
Funk G 785W	61.1	57.1	67	24	9	98	4.5	1.2	2.3	1.8	81.8	100
Funk G 710A	60.3	......	71	18	11	99	4.3	0.9	2.0	1.8	81.8	95
Pfister (P.A.G.) 655	60.1	55.7	77	19	4	99	4.5	1.0	2.3	2.0	82.8	99
Pfister (P.A.G.) 486	57.3	54.1	79	9	12	97	4.0	1.1	2.2	2.2	84.9	97
Pfister (P.A.G.) 636	57.1	....	70	18	12	100	3.5	1.0	1.7	1.9	81.8	97
Coker 911	56.2	54.2	78	15	7	98	3.8	0.9	2.2	2.0	82.1	96
McCurdy 1001A	55.1	......	67	23	10	97	4.1	0.9	2.0	1.8	80.9	97
Keystone 107W	47.8	......	71	22	7	99	3.5	0.8	1.9	2.0	79.1	97
Broadbent 302	45.5	......	71	19	10	98	4.2	0.9	2.3	2.0	79.7	95
Station Mosby**	45.4	46.0	50	37	13	97	5.0	0.8	2.1	2.1	79.6	98

[1] Data from Stoneville not included.

**Open pollinated variety.

*Experimental hybrids; no seed available.

Main hybrid test at Verona, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ears infested	Ear ht.	Ears per plant	Husk		Shelling	Moist in grain	Stand
			Stalk	Root	Earworm			Length	Tightness			
	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Miss. 1123*	87.9	73	23	4	90	4.7	1.5	3.3	2.8	81.7	14.3	99
Tenn. 29	84.4	81	15	4	98	4.1	1.1	1.7	1.5	83.1	14.3	98
Dixie 22	79.5	45	48	7	99	4.7	1.2	2.3	1.8	81.6	15.3	94
Dixie 82	79.5	44	47	9	96	4.8	1.4	3.3	2.8	79.3	17.0	100
Funk G 779W	78.2	40	56	4	98	3.9	1.1	1.2	1.2	84.0	15.0	100
Miss. 3226*	77.8	68	28	4	96	4.5	1.3	4.3	3.0	79.6	15.2	99
Dixie 33	77.5	24	63	13	99	4.4	1.2	2.0	1.8	83.4	14.8	94
Pioneer 309A	76.8	79	15	6	99	3.7	0.9	2.3	2.0	85.2	14.8	103
Pfister (P.A.G.) 631	76.2	38	48	14	99	3.7	1.0	2.2	1.8	80.8	14.5	95
Dixie 17	75.3	26	59	15	97	4.6	1.3	3.3	2.0	84.0	15.2	99
Pfister (P.A.G.) 486	74.1	70	17	13	94	4.2	1.3	2.2	2.2	86.3	15.2	99
Pfister (P.A.G.) 655	74.1	57	40	3	98	4.6	1.1	2.3	2.3	83.5	12.8	101
Dixie 11	73.9	17	68	15	92	4.6	1.4	2.0	2.0	85.7	14.2	99
Pioneer 301A	72.3	61	33	6	100	3.3	1.0	2.0	1.0	81.7	15.1	99
Broadbent 337W	72.1	35	46	19	100	3.7	0.9	2.0	1.8	80.5	14.2	94
Coker 911	71.9	73	24	3	98	3.8	1.1	1.8	1.7	84.9	14.8	96
Pfister (P.A.G.) 653	70.8	43	54	3	94	3.8	1.2	2.2	2.2	81.7	15.1	96
Funk G 785W	68.0	42	53	5	97	4.4	1.2	2.0	2.0	81.6	15.2	102
Tenn. 90	67.2	70	24	6	100	4.6	0.9	2.5	1.7	81.5	14.3	99
Pfister (P.A.G.) 636	66.1	60	31	9	99	3.6	1.0	2.0	2.0	83.2	14.3	101
McCurdy 1001A	64.3	40	55	5	95	4.2	0.9	2.2	2.0	81.0	15.1	100
Funk G710A	61.6	59	35	6	98	4.3	1.0	2.0	2.0	82.0	15.8	89
Broadbent 302	58.7	50	44	6	96	4.3	1.0	2.3	2.3	80.3	15.0	96
Station Mosby**	50.7	18	70	12	95	4.9	0.8	2.2	2.2	80.6	14.3	99
Keystone 107W	46.1	41	55	4	98	3.6	0.7	2.2	2.0	79.8	14.8	98
Spears**	13.0	5	74	21	100	5.5	0.4	3.0	2.0	70.0	15.5	93

A difference in yield of at least 7.5 bushels per acre is required to be considered significant. C. V. = 9.2%.

*Experimental hybrids; no seed available. **Open pollinated variety.

Main hybrid test at State College, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Date 50% silking	Ears infested	Ear ht.	Ears per plant	Husk		Shelling	Stand
			Stalk	Root		Earworm			Length	Tightness		
	bu.	%	%	%	ave.	%	ft.	no.	in.	grade	%	%
Funk G 779W	69.5	84	6	10	7-23	100	4.0	1.2	2.3	1.5	83.9	101
Tenn. 29	68.1	95	0	5	7-21	100	3.7	1.1	2.2	2.2	82.2	102
Dixie 22	67.6	90	5	5	7-21	99	4.3	1.2	2.2	1.5	81.9	97
Dixie 82	66.5	85	9	6	7-23	97	4.6	1.5	2.3	2.0	80.5	99
Funk G 710A	61.6	79	7	14	7-21	100	4.0	1.0	2.3	1.7	83.2	97
Pfister (P.A.G.) 653	61.2	87	6	7	7-20	99	3.3	1.3	2.5	1.8	81.8	98
Pfister (P.A.G.) 655	60.5	93	5	2	7-18	98	4.1	1.1	2.0	1.7	84.7	98
Tenn. 90	60.0	83	7	10	7-21	100	3.8	1.0	2.3	2.0	84.6	95
Miss. 3226*	59.3	92	0	8	7-23	98	4.3	1.3	3.0	2.2	82.1	99
Dixie 33	59.3	84	10	6	7-21	100	4.2	1.2	2.3	2.0	83.8	102
Pfister (P.A.G.) 631	58.5	78	2	20	7-18	100	2.7	1.0	2.0	1.7	81.0	96
Funk G 785W	57.4	81	3	16	7-25	97	4.3	1.2	2.0	1.7	81.8	99
Pfister (P.A.G.) 636	55.6	82	6	12	7-19	100	3.1	1.1	1.8	1.8	82.0	96
Miss. 1123*	54.6	85	3	12	7-23	100	4.1	1.3	2.2	1.5	81.1	98
Dixie 11	54.6	59	11	30	7-24	96	4.2	1.4	2.5	1.8	82.7	100
McCurdy 1001A	54.0	83	2	15	7-23	98	3.8	1.0	2.2	1.7	82.2	96
Broadbent 337W	54.0	71	1	28	7-19	100	2.8	1.0	2.3	1.8	80.8	98
Pioneer 309A	53.5	90	0	10	7-22	100	3.5	0.9	2.5	2.2	85.5	96
Dixie 17	53.3	53	10	37	7-21	99	4.1	1.3	2.5	2.0	83.5	97
Pioneer 301A	50.6	97	0	3	7-18	100	2.7	0.9	2.0	1.3	80.3	97
Pfister (P.A.G.) 486	49.0	88	0	12	7-20	99	3.7	1.1	2.2	2.2	84.5	98
Coker 911	45.2	91	2	7	7-22	96	3.4	1.0	2.7	2.2	81.8	98
Station Mosby**	44.6	67	16	17	7-25	96	4.8	1.0	2.2	2.0	80.3	98
Keystone 107W	44.0	83	3	14	7-20	100	3.2	0.8	2.3	2.0	79.0	96
Broadbent 302	40.2	89	0	11	7-23	98	3.8	0.9	2.3	1.8	79.6	98

A difference in yield of at least 9.9 bushels per acre is required to be considered significant. C. V. = 15.2%.

*Experimental hybrids; no seed available.

**Open pollinated variety.

Main hybrid test at Stoneville, Mississipppi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ear-worm damage	Ear ht.	Ears per plant	Husk length	Shelling	Unsound ears	Stand	Ear ap-pear-ance
			Root	Stalk								
	bu.	%	%	%	score[1]	ft.	no.	in.	%	%	%	score[2]
Dixie 17	84.2	72	17	11	2.0	4.7	1.3	2.0	85.7	9	94	2.2
Miss. 1123*	75.5	82	7	11	1.6	5.1	1.2	3.5	82.4	10	98	2.5
Pfister (PAG) 653	69.5	87	9	4	1.4	4.1	1.1	2.5	83.1	8	98	2.2
Funk G779W	68.3	69	27	4	2.8	4.2	1.0	0.2	83.4	14	94	2.8
Pfister (PAG) 631	67.0	80	13	7	3.0	3.8	1.0	1.5	80.1	25	98	3.4
Tenn. 29	66.9	93	6	1	2.5	4.1	1.0	2.0	82.3	10	96	2.8
Dixie 22	66.8	68	19	13	2.0	5.0	1.1	2.3	82.3	10	96	2.4
Pioneer 309A	65.3	94	1	5	3.2	3.8	0.9	1.2	85.4	12	95	3.2
Dixie 11	64.0	68	26	6	1.0	4.7	1.2	3.0	85.7	3	98	1.1
Dixie 33	62.6	86	7	7	2.6	5.1	0.9	1.8	83.2	13	97	3.0
Broadbent 337W	60.8	72	13	15	3.2	3.5	0.9	2.0	80.7	26	94	3.8
Funk G785W	59.8	79	17	4	1.5	4.8	1.2	2.8	84.4	2	99	1.6
Funk G710A	59.6	75	12	13	2.3	4.6	0.8	1.7	82.7	10	98	2.6
Dixie 82	57.2	79	14	7	1.0	5.2	1.1	3.5	80.8	6	94	2.1
Tenn. 90	56.1	86	5	9	3.8	4.5	0.8	2.3	81.6	22	99	3.8
Keystone 107W	54.6	90	7	3	4.0	3.8	0.8	1.3	80.8	19	97	4.0
Coker 911	53.3	71	20	9	1.2	4.2	0.7	2.2	82.0	9	94	2.6
Pfister (PAG) 636	51.4	71	16	13	2.5	4.0	0.9	1.2	82.7	15	95	3.1
Pfister (PAG) 486	50.6	81	8	11	1.5	4.1	0.8	2.3	86.4	8	94	2.9
Miss. 3226*	50.0	85	13	2	2.4	3.5	1.0	3.5	78.6	3	94	2.6
McCurdy 1001A	48.6	79	12	9	2.0	4.4	0.8	1.5	81.9	10	95	2.4
Pfister (PAG) 655	47.4	82	13	5	2.2	4.9	0.7	2.5	82.8	11	99	3.4
Station Mosby**	42.2	66	24	10	2.2	5.3	0.7	2.0	80.4	14	97	3.4
Broadbent 302	38.9	75	13	12	1.2	4.6	0.7	2.2	81.7	9	92	2.9
Miss. 2004*	38.1	97	9	1	1.2	5.2	0.6	3.3	79.4	4	96	2.8

Mean yield 58.3.

A difference in yield of at least 15.1 bushels ber acre is required to be considered significant. C. V. = 22.5%.

[1] Earworm damage: 0 = none, 4 = severe damage.

[2] Ear appearance at harvest: 1 = good, 4 = poor.

*Experimental hybrids; no seed available. ** Open polliinated variety.

Average of data from hybrid corn tests grown at Yazoo City, Brooksville, Newton, and Raymond, 1954.

Pedigree	Acre yield	3-year average 1952-54	Plants erect at harvest	Lodging		Ears infested	Ear ht.	Ears per plant[1]	Husk[1]		Shell-ing[2]	Moist in grain[2]	Stand
				Root	Stalk	Ear-worm[2]			Length	Tight-ness			
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Dixie 33	47.0	.....	80	13	7	98	3.8	1.1	2.1	1.6	83	11.0	90
Dixie 17	45.2	43.6	74	10	16	96	3.6	1.2	2.1	1.8	84	11.3	91
Miss. 3228*	43.0	..	87	7	6	94	3.8	1.1	3.2	2.7	78	11.6	92
Dixie 22	43.0	39.3	79	12	9	98	3.7	1.1	2.8	1.9	80	12.1	91
Miss. 1123*	42.9	39.5	90	4	6	94	3.9	1.1	3.2	2.3	80	11.2	92
Miss. 3208*	42.3	.....	92	4	4	96	3.8	1.2	3.0	2.2	78	11.6	89
Dixie 82	40.8	39.3	86	8	6	97	4.2	1.2	3.0	2.4	78	11.7	88
Coker 911	39.8	37.2	87	9	4	95	3.4	1.1	2.4	2.0	82	11.8	92
Pfister (P.A.G.) 486	39.7	37.3	86	6	8	98	3.5	1.2	2.3	1.7	86	12.0	88
Miss. 3226*	38.9	....	90	5	5	96	3.8	1.2	3.6	2.8	77	11.8	91
Dixie 11	38.2	36.8	68	24	8	95	4.2	1.4	2.8	2.6	83	11.4	90
Miss. 2004*	37.3	.....	93	5	2	97	4.4	1.0	3.2	2.6	80	12.0	90
Funk G710	37.3	....	76	14	10	96	3.7	1.1	2.3	1.7	80	11.6	88
Funk G740	35.9	....	85	8	7	97	4.5	1.0	2.4	2.2	80	11.8	93
Miss.. 3222*	35.7		92	4	4	97	4.0	0.9	3.9	2.8	76	11.4	91
Funk G 785W	35.4	32.5	79	15	6	98	3.8	1.2	2.2	1.9	80	11.7	91
Pfister (P.A.G.) 655	35.4	....	79	16	5	96	3.7	1.1	2.6	2.0	81	11.6	88
Funk G 714A	35.2	29.6	75	13	12	96	3.8	1.2	3.2	2.6	80	11.4	92
Coker 811	33.7	31.8	88	8	4	91	3.4	1.2	2.9	2.4	78	11.7	88
Dixie 18	31.9	32.0	76	14	10	89	4.6	1.1	4.0	2.9	81	12.4	84
Station Mosby**	31.8	29.0	64	22	14	96	4.7	0.9	2.6	2.0	80	11.4	90
McCurdy 1003	31.2	....	70	16	14	90	4.2	0.9	3.0	2.4	82	11.4	89
Miss. 1125*	26.2	....	86	3	11	94	4.9	0.8	3.8	2.5	77	12.8	91

[1] No data from Raymond.

[2] No data from Raymond and Yazoo City.

*Experimental hybrids; no seed available.

** Open-pollinated variety.

Main hybrid test at Yazoo City, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ear-worm damage	Ear ht.	Ears per plant	Husk		Stand	Ear appear-ance
			Root	Stalk				Length	Tight-ness		
	bu.	%	%	%	score[1]	ft.	no.	in.	score[2]	%	score[3]
Miss. 3208*	73.5	92	5	3	1.3	4.1	1.1	3.3	2.0	92	1.3
Dixie 33	72.4	80	11	9	3.0	4.2	1.0	2.0	1.0	92	2.7
Miss. 3204*	66.8	94	3	3	1.0	4.7	1.2	3.8	2.7	88	1.3
Dixie 22	66.7	78	10	12	2.0	3.9	1.1	3.0	1.8	93	2.0
Miss. 3228*	66.4	91	5	4	1.7	4.3	1.0	3.5	2.8	90	2.5
Dixie 17	65.3	71	13	16	2.3	4.1	1.1	2.3	1.7	88	2.7
Miss. 1123*	65.1	91	3	6	2.3	4.4	1.0	3.7	2.3	92	2.3
Funk G710	62.9	75	11	14	2.3	4.5	1.0	2.5	1.8	91	2.8
Funk G740	62.6	85	11	4	1.7	5.3	1.0	3.2	2.7	93	2.3
Dixie 82	61.6	78	13	9	2.0	4.8	1.1	3.5	2.0	92	2.0
Coker 811	60.8	90	6	4	1.3	3.7	1.1	3.6	2.7	93	2.8
Coker 911	60.4	90	4	6	2.3	3.8	1.0	2.8	2.0	91	2.5
Dixie 11	60.2	65	25	10	1.0	4.5	1.3	2.5	2.8	86	1.7
Pfister (PAG) 655	60.1	77	16	7	2.3	4.1	1.0	3.2	1.8	89	2.3
Funk G785W	60.1	77	12	11	2.0	4.6	1.1	2.7	2.2	91	2.1
Pfister (PAG) 486	58.4	79	7	14	2.3	3.7	1.1	2.7	1.8	90	3.0
Miss. 3226*	58.3	96	6	8	1.7	4.0	1.0	3.8	2.8	96	2.8
Funk G714A	56.9	71	16	13	2.0	4.0	1.1	3.0	2.5	91	2.1
Miss. 3222*	56.6	85	10	5	2.7	4.2	1.0	4.0	2.8	90	3.0
Miss. 2004*	55.3	89	7	4	1.5	5.1	1.0	3.8	2.8	87	2.5
Station Mosby**	51.7	50	30	20	3.0	5.1	0.9	2.7	1.7	92	3.0
Dixie 18	50.3	71	22	7	1.0	5.5	1.0	4.3	3.0	90	1.7
Miss. 1125*	48.1	97	1	2	1.3	5.5	0.9	4.3	2.3	93	2.7
McCurdy 1003	44.7	73	14	13	1.3	4.8	0.8	3.3	2.2	88	2.0

A difference in yield of at least 12.0 bushels per acre is required to be considered significant.

C. V. = 17.5%.

Note: Earworm, ears per plant and ear appearance data from 3 replications, remaining data from 6 replications.

[1] Earworm damage: 0 = none, 4 = severe damage.

[2] Husk tightness: 0 = very loose, 4 = very tight.

[3] Ear appearance at harvest: 1 = very good, 4 = poor.

*Experimental hybrids; no seed available.

**Open pollinated variety.

Main hybrid test at Brooksville. Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ears infested	Ear ht.	Ears per plant	Husk		Shelling	Moist in grain	Stand
			Root	Stalk	Earworm			Length	Tight-ness			
	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Dixie 33	44.4	51	42	7	98	3.5	0.9	2.2	2.0	83	10.0	94
Dixie 22	39.2	56	38	6	98	3.8	0.9	3.2	1.8	80	11.2	90
Pfister (P.A.G.) 486	36.8	80	15	5	97	3.7	1.0	2.2	1.8	86	11.4	86
Miss. 1123*	35.6	80	13	7	92	3.8	0.9	2.8	2.0	79	10.4	94
Dixie 82	34.4	76	21	3	98	4.2	1.0	2.3	2.2	78	10.8	88
Miss. 3226*	34.2	85	13	2	95	3.8	1.1	3.0	2.7	75	10.8	86
Miss. 3228*	33.7	71	21	8	95	4.0	0.9	2.7	2.5	77	11.0	91
Coker 911	33.1	65	31	4	93	3.4	0.9	2.2	2.0	81	10.6	91
Dixie 17	33.1	57	23	20	97	3.4	0.9	1.8	1.7	84	10.2	88
Miss. 3208*	31.0	82	12	6	97	3.8	1.1	2.7	2.0	76	10.4	77
Funk G 710	29.2	47	45	8	95	3.5	0.9	2.5	2.0	78	10.4	79
Pfister (P.A.G.) 655	27.1	54	43	3	94	3.7	0.9	2.5	2.3	79	10.4	89
Miss. 2004*	27.0	86	14	0	97	3.9	0.9	2.7	2.3	78	11.0	86
Miss. 3222*	26.5	89	6	5	97	4.2	0.1	3.3	2.7	74	10.4	86
Funk G 740	25.8	74	20	6	96	4.3	0.8	2.0	2.0	80	10.8	96
Dixie 11	25.2	27	64	9	94	4.1	1.0	2.7	2.2	83	10.6	88
Funk G 714A	25.0	57	33	10	96	4.0	0.9	2.8	2.3	78	10.6	85
Funk G 785W	24.0	47	49	4	97	3.6	0.9	1.8	1.5	79	10.8	84
McCurdy 1003	23.3	43	52	5	89	3.9	0.6	2.7	2.3	82	10.2	88
Broadbent 303W	23.1	95	5	0	88	4.3	0.6	2.3	1.8	75	12.4	96
Dixie 18 (Composite)	21.0	61	34	5	86	4.4	0.7	3.2	2.8	80	12.0	82
Dixie 18	20.2	58	34	8	87	4.6	0.8	3.2	2.8	81	10.4	84
Coker 811	20.0	74	24	2	88	3.3	0.8	2.2	2.0	77	10.8	85
Station Mosby**	18.2	39	53	8	95	4.3	0.6	2.5	2.0	81	10.6	82
Miss. 1125*	15.3	88	11	1	94	4.7	0.5	2.8	2.3	76	11.7	87

A difference in yield of at least 4.5 bushels per acre is required to be considered significant.

*Experimental hybrids; no seed available. **Open-pollinated variety.

Main hybrid test at Newton, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging Root	Lodging Stalk	Ears infested Earworm	Ear ht.	Ears per plant	Husk Length	Husk Tightness	Shelling	Moist in grain	Stand
	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Dixie 17	66.2	99	9	1	96	3.5	1.6	2.2	2.2	84	12.4	96
Broadbent 303W	60.8	96	0	4	98	3.7	1.3	2.2	1.7	84	11.7	90
Miss. 3228*	58.9	96	0	4	94	3.3	1.3	3.5	3.0	79	12.2	97
Dixie 82	58.8	95	0	5	96	3.8	1.6	3.3	3.0	79	12.6	91
Dixie 33	57.1	98	0	2	99	3.7	1.3	2.2	1.7	83	12.1	90
Coker 911	55.9	100	0	0	97	3.0	1.4	2.3	2.2	82	12.9	93
Miss. 1123*	55.7	98	0	2	96	3.7	1.5	3.3	2.8	80	11.9	92
Miss. 3208*	54.9	98	0	2	94	3.3	1.5	3.0	2.8	79	12.7	95
Pfister (P.A.G.) 486	54.9	96	0	4	98	3.0	1.4	2.2	1.5	87	12.7	90
Miss. 3226*	54.3	97	0	3	97	3.3	1.5	4.2	3.0	79	12.9	89
Dixie 18	54.2	99	0	1	92	4.5	1.6	4.5	3.0	82	12.7	93
Miss. 2004*	54.0	99	0	1	97	4.2	1.2	3.3	2.8	81	13.0	94
Dixie 22	53.8	99	0	1	97	3.5	1.2	2.3	2.3	81	13.0	89
Miss. 3222*	53.0	96	1	3	97	4.0	1.5	4.5	3.0	79	12.4	97
Funk G 710	53.0	95	1	4	98	3.5	1.3	2.0	1.5	81	12.9	91
Funk G 714A	52.7	91	0	9	97	3.5	1.7	4.0	3.0	81	12.2	95
Dixie 11	52.6	95	0	5	96	3.8	1.8	3.3	2.8	83	12.1	91
Funk G 785W	51.5	96	0	4	99	3.2	1.7	2.3	2.2	82	12.6	93
McCurdy 1003	49.9	99	0	1	92	4.2	1.2	3.2	2.8	82	12.6	96
Pfister (P.A.G.) 655	49.6	99	0	1	99	3.2	1.3	2.2	2.0	83	12.7	93
Station Mosby**	49.6	96	0	4	96	4.8	1.3	2.8	2.5	80	12.2	94
Broadbent 302	49.1	99	0	1	97	3.5	1.3	2.3	2.2	81	12.2	88
Coker 811	49.0	100	0	0	94	3.2	1.6	3.0	2.7	79	12.6	94
Funk G 740	47.8	98	0	2	98	4.5	1.2	2.0	2.0	79	12.9	95
Miss. 1125*	39.2	99	0	1	93	4.7	1.1	4.3	3.0	78	14.0	95

A difference in yield of at least 4.8 bushels per acre is required to be considered significant. C. V. = 8%.

*Experimental hybrids; no seed available.

**Open-pollinated variety.

Main hybrid test at Lucedale, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ears infested		Ear ht.	Ears per plant	Husk		Shelling	Moist in grain	stand
			Root	Stalk	Rice weevil	Ear-worm			Tight-ness	Length			
	bu.	%	%	%	%	%	ft.	no.	in.	grade	%	%	%
Miss. 1125*	65.6	93	1	6	20	76	4.0	1.0	3.3	2.7	85.6	15.3	96
Dixie 82	64.1	67	3	30	31	91	3.3	1.2	2.0	1.5	81.6	14.8	97
Miss. 3226*	58.8	81	2	17	22	84	3.7	1.3	2.7	2.5	81.7	15.2	91
La. 521	57.4	60	5	35	18	86	4.0	1.2	2.3	2.3	86.2	15.0	94
Miss. 2004*	56.5	93	0	7	27	81	3.8	1.1	2.5	2.2	82.5	14.9	96
Miss. 3222*	56.5	89	0	11	30	88	3.7	1.3	2.2	2.0	81.8	14.8	92
Miss. 3204*	56.5	87	1	12	47	87	3.7	1.2	2.2	1.8	81.5	15.0	92
Dixie 11	56.4	41	7	52	10	79	3.5	1.2	2.3	2.2	86.7	15.8	95
Miss. 1123*	56.1	68	5	27	13	92	3.3	1.2	2.2	2.0	83.0	15.3	94
Miss. 3228*	55.7	88	0	12	45	87	3.5	1.1	2.8	2.5	82.0	15.0	96
Miss. 3208*	55.6	82	1	17	27	93	3.5	1.1	2.2	1.8	80.6	15.2	96
Dixie 18	53.9	85	3	12	25	83	3.7	1.1	3.0	2.3	84.8	15.0	92
McCurdy 1003	53.3	87	1	12	11	82	3.5	1.0	2.2	2.2	84.8	15.2	97
Funk Exp. 24004*	50.6	36	5	59	28	91	3.3	1.0	2.0	2.0	84.3	15.3	96
Funk G 740	48.8	88	2	10	21	88	3.7	1.0	2.3	2.2	82.2	15.2	97
Funk G 737A	45.2	82	2	16	19	87	3.5	1.0	2.0	1.8	81.2	15.8	96
Station Mosby**	44.4	55	10	35	41	91	4.0	1.0	2.2	1.7	82.4	14.6	96
Cornell 11	37.8	56	18	26	9	84	4.0	1.0	2.0	2.0	78.6	15.1	89

A difference in yield of at least 7.7 bushels per acre is required to be considered significant. C. V. = 12.4%.

*Experimental hybrids; no seed available. **Open pollinated variety.

Average of data from hybrid corn tests grown at Poplarville and Lucedale, 1954.

Pedigree	Acre yield	3-year av. yield 1952-54	Plants erect at harvest	Lodging		Ears infested		Ear ht.	Ears per plant	Husk		Shelling	Moist in grain	Stand
				Root	Stalk	Rice weevil	Ear-worm			Length	Tight-ness			
	bu.	bu.	%	%	%	%[1]	%	ft.	no.	in.	grade	%	%	%
Miss. 1125*	59.0	----	96	1	3	14	81	3.9	1.2	3.8	2.7	82.9	15.1	97
Dixie 82	56.0	39.3	76	8	16	32	92	3.4	1.2	2.2	1.9	80.0	14.7	98
La. 521	52.0	----	62	18	20	18	90	3.8	1.4	2.6	2.4	84.4	15.1	94
Dixie 11	50.6	39.4	40	30	30	8	83	3.2	1.4	2.5	2.4	85.5	15.3	96
Miss. 3226*	50.1	----	86	5	9	17	86	3.4	1.3	3.0	2.6	79.8	14.9	94
Miss. 3204*	50.0	----	92	2	6	36	88	3.4	1.2	3.0	2.4	79.4	14.8	96
Miss. 3208*	49.6	----	86	5	9	24	92	3.2	1.2	2.7	2.3	79.1	14.8	98
Dixie 18	48.2	34.0	90	4	6	20	82	3.7	1.2	3.8	2.6	83.0	15.0	94
Miss. 2004*	48.1	----	94	2	4	18	84	3.6	1.0	2.8	2.5	81.2	14.8	96
Miss. 3222*	47.4	----	92	2	6	27	86	3.4	1.3	2.8	2.4	79.0	14.7	95
McCurdy 1003	46.8	----	83	11	6	15	82	3.4	1.0	2.8	2.4	83.6	14.8	97
Miss. 3228*	46.6	----	87	7	6	31	87	3.4	1.1	3.2	2.6	79.0	14.8	98
Miss. 1123*	46.6	35.4	78	8	14	18	92	3.3	1.2	2.8	2.4	80.6	14.6	96
Funk Exp. 24004*	45.6	----	34	26	40	18	90	3.4	1.1	2.2	2.2	83.0	14.8	97
Funk G 740	44.6	----	88	7	5	20	90	3.6	1.1	2.2	2.0	80.6	14.8	96
Funk G 737A	41.8	----	76	14	10	21	89	3.4	1.2	2.1	2.0	79.9	15.2	97
Station Mosby**	40.4	29.3	52	22	26	35	90	3.8	1.2	2.2	1.6	80.4	14.6	97
Corneli 11	32.0	----	54	29	17	12	86	3.8	1.0	2.1	2.1	74.8	15.0	91

[1] Data from Lucedale only.

*Experimental hybrids; no seed available.

**Open pollinated variety.

Main hybrid test at Poplarville, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ears infested	Ear ht.	Ears per plant	Husk		Shell-ing	Moist in grain	Stand
			Root	Stalk	Earworm			Length	Tight-ness			
	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Miss. 1125*	52.5	99	1	0	86	3.8	1.3	4.2	2.7	80.2	14.9	98
Dixie 82	47.8	86	13	1	92	3.5	1.3	2.5	2.3	78.5	14.6	98
La. 521	46.7	64	32	4	94	3.7	1.6	2.8	2.5	82.5	15.2	93
Dixie 11	44.7	39	53	8	87	3.0	1.5	2.7	2.5	84.3	14.8	98
Miss. 3208*	43.7	90	9	1	90	3.0	1.2	3.2	2.8	77.6	14.4	99
Miss. 3204*	43.5	97	2	1	90	3.2	1.3	3.8	3.0	77.3	14.6	100
Dixie 18	42.5	94	6	0	82	3.7	1.4	4.5	2.8	81.2	15.0	97
Miss. 3226*	41.4	92	7	1	89	3.2	1.3	3.2	2.7	77.9	14.6	98
Funk Exp. 24004*	40.6	32	47	21	89	3.5	1.2	2.5	2.3	81.6	14.4	98
McCurdy 1003	40.3	79	20	1	83	3.3	1.1	3.3	2.5	82.4	14.4	97
Funk G 740	40.3	87	13	0	91	3.5	1.2	2.0	1.7	79.1	14.4	96
Miss. 2004*	39.7	95	5	0	86	3.3	1.0	3.2	2.8	79.9	14.6	97
Funk G 737A	38.5	70	26	4	91	3.2	1.3	2.2	2.2	78.6	14.7	98
Miss. 3222*	38.4	96	3	1	87	3.2	1.3	3.5	2.8	76.2	14.6	98
Miss. 3228*	37.4	86	13	1	87	3.2	1.1	3.5	2.8	75.9	14.6	100
Miss. 1123*	37.2	89	10	1	91	3.3	1.2	3.3	2.8	78.2	13.9	98
Station Mosby**	36.3	50	34	16	90	3.7	1.3	2.3	1.5	78.3	14.6	98
Corneli 11	26.2	51	40	9	87	3.7	1.1	2.2	2.2	71.1	14.8	93

A difference in yield of at least 5.4 bushels per acre is required to be considered significant. C. V. = 11.3%.

*Experimental Hybrids; no seed available. **Open pollinated variety.

Main hybrid test at Raymond, Mississippi, 1954.

Pedigree	Acre yield	Plants erect at harvest	Lodging		Ear ht.	Stand
			Root	Stalk		
	bu.	%	%	%	ft.	%
Dixie 17	16.1	70	3	27	3.5	91
Miss. 1123*	15.1	91	1	8	3.8	91
Dixie 11	14.8	84	8	8	4.5	96
Dixie 33	14.3	91	0	9	3.8	86
Miss. 3228*	13.0	90	0	10	3.8	91
Miss. 2004*	12.8	96	0	4	4.5	95
Dixie 22	12.2	83	0	17	3.7	93
Coker 911	10.0	93	0	7	3.5	91
Miss. 3208*	9.9	96	0	4	4.0	92
Miss. 3226*	8.8	92	1	7	4.0	93
Pfister (P.A.G.) 486	8.8	89	0	11	3.5	88
Dixie 82	8.3	95	0	5	4.0	83
Station Mosby**	7.7	73	3	24	4.5	93
Funk G 740	7.5	82	0	18	3.8	98
McCurdy 1003	7.1	63	0	37	4.0	85
Miss. 3222*	6.7	97	0	3	3.7	90
Funk G 714A	6.3	82	1	17	3.7	85
Funk G 785W	5.9	96	0	4	3.8	95
Dixie 18	5.4	72	1	27	4.2	94
Coker 811	5.0	89	0	11	3.5	78
Pfister (P.A.G.) 655	4.7	89	3	8	3.8	80
Funk G 710	4.1	85	0	15	3.3	89
Mp 317 x Mp 313	2.6	76	0	24	2.8	29
Dixie 18 (Composite)	2.0	73	1	26	3.8	70
Miss. 1125*	2.0	61	0	39	4.7	88

A difference in yield of at least 4.6 bushels per acre is required to be considered significant. C. V. = 45.9%. *Experimental hybrids; no seed available. **Open-pollinated variety.

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A Study of the

COST OF PROCESSING SEED IN MISSISSIPPI

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

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A Study of the Cost of Processing Seed in Mississippi

By WOODSON W. MOFFETT, JR. and W. E. CHRISTIAN, JR.

Several factors account for the increasing importance of the seed industry[1] to the economy of Mississippi. Among the more important ones are (1) the increased emphasis on grassland farming, (2) acreage controls, and (3) changes in technology of production which have caused shifts to crops better adapted to the soil and topography of the state. The rapidly increasing importance of the seed industry has emphasized the need for economic research information. However, since the industry is relatively young, there is very little such information available. Only two economic studies relating to the Mississippi seed industry have been completed and the results published[2]. One of these surveyed the size of the industry, the processing facilities available, and some of the major problems confronting seed processors in the state. The other was concerned primarily with the supply side of the industry. It analyzed the production trends, the prospective demand, the production pattern (with particular emphasis on the competitive position of seed production versus grazing for livestock), and the marketing practices followed by seed producers.

As noted above, the survey of the seed industry in Mississippi, made in 1949, included a list of the major problems confronting seed processors. It was not surprising that many of these problems were present because of a limited knowledge of both the technical aspects of processing seed and the actual cost involved in operating processing plants. The Regional Seed Processing Research Laboratory at Mississippi State College was established to help the processor overcome the technical problems, but no data have been made available on the actual cost of processing these seed. This study was designed to furnish such information.

Objectives

The objectives of this study were:

1. To determine the cost of operating different types and sizes of seed processing equipment most suitable for use in Mississippi processing plants of different sizes.
2. To determine the effect of physical

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[1] The "seed industry" as the term is used in this publication refers to the production and marketing of seeds such as pasture grass seed, (including clovers and lespedeza) and small grains, but does not include cotton, horticultural or forestry seed. The "cost of processing" has been studied on the same basis.

[2] Christian, W. E., Jr., and Doyle, B. K., **Mississippi Seed Industry,** Mississippi Agricultural Experiment Station Circular 153, June, 1950; and Christian, W. E. Jr., **Some Factors Affecting the Competitive Position of Mississippi Seed Producers,** Mississippi Agricultural Experiment Station Technical Bulletin 36, April, 1953.

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Appreciation is extended to members of the Agronomy Department and Agricultural Engineering Department of the Experiment Station along with members of the Agricultural Economics staff for their assistance and helpful suggestions during the planning and development of this study. The authors are especially grateful to Dr. R. J. Saville, Head, Department of Agricultural Economics, not only for his helpful suggestions during the time the study was conducted, but also for critically reading the manuscript.

Acknowledgement is also due the owners and managers of seed processing plants who cooperated in this study. Without the data supplied by these individuals this study would not have been possible.

volume, equipment and building arrangement, condition and quality of seed to be processed, and different combinations of machines on the cost of processing seeds.

Scope and Method of Obtaining Data

Ten plants were originally selected for study. However, one was not used because sufficient data were not obtained on the time required to perform the various operations. The nine remaining plants were divided into three groups as follows: (1) Group I—plants having facilities for handling seeds received in bulk; (2) Group II—plants comparable in size to those in Group I but having no facilities for handling seed received in bulk; and (3) Group III—small plants with only one screen machine for which time data were not obtained.

Data were obtained by personal interview in the Spring of 1953 from each of the plants in question on (1) the original cost of the buildings and equipment used in seed processing, (2) the cash expenses incurred by the plant during 1952, such as utilities expenses, and the cost of maintenance and repair on equipment, (3) general information on the labor force required at minimum operation and maximum operation, (4) machine capacity for different kinds of seed, and (5) quantity of seed cleaned during 1952. After the beginning of the 1953 cleaning season, i.e. beginning in June, the plants were re-visited and data taken to determine the time required to perform various operations with different facilities for receiving and handling the seed and different arrangements of machines. Time data were taken in five of the plants for three days each and in one plant for four days. It was felt that observation for this period would give a fairly representative picture of the time required to perform different operations within the plant.

The Approach to the Problem

Nature of Problem: The most desirable result of a study of this nature would be to obtain data showing the cost of processing each kind of seed with different machines and different arrangements of machines. However, early in the planning stages of the study it was recognized that certain characteristics of the seed processing industry kept such an approach from being feasible. Most important in this respect was the wide variation in the quantity of seed that can be cleaned on any given machine as a result of the condition of the seed when received by the plant. Also of importance was the efficiency of the machine attributable to the operator.

It was considered desirable to determine the cost of operating the machine for a given period of time. The operator could then determine the cost of processing any given lot of seed by estimating the time to process it. The only practical approach seemed to be a computation of the cost of operating the "primary" machine in the plant. Since the screen and air machine is considered by most operators to be a general purpose machine and the others to be more specialized in nature—the per-hour operating costs were computed for only the screen and air machine. The annual fixed costs were computed for the length separating, the specific gravity, and other specialized machines; but only the pro rata building costs for the space actually occupied by the machine was included in these annual fixed costs. That is, no building charge was made to the specialized machines for the storage space occupied by the seed prior to and after processing and no attempt was made to compute the labor cost involved in the operation of the specialized machines.

Another problem peculiar to this industry was the highly seasonal nature of plant operation. Some plants operated at "full capacity" for only three or four months in the year, at reduced capacity during three or four months, and only occasionally during the remainder of the year. Such a seasonal pattern generally makes it desirable for plant operators to have a supplementary enterprise in conjunction with the processing plant. In some plants this was a feed crushing and mixing enterprise, in others a retail seed and fertilizer store, and in others a general farm supply store with a full line of feed, seed and fertilizer. Some plants were actually supplementary enterprises to some other operation. For example, two small plants were located on farms and were supplementary to the farming operations, and two larger plants were supplementary to general farm supply stores.

The data have been computed to show operating costs when the total building costs are charged to processing and when a proportion of the total cost (as estimated by the owner or operator) is charged to other enterprises using the same building and facilities. In some instances this allocation of costs made considerable difference in the total fixed costs; whereas, in others it made very little.

The computation of overhead labor costs, on the other hand, was based on the operator's statement relative to the minimum labor force maintained regardless of volume of seed cleaned. Since seed processing is a specialized industry, many of the operators feel that it is necessary to keep at least one, and in some cases two laborers, in addition to the plant foreman or superintendent as a nucleus for his labor force. This expenditure for labor was computed as overhead labor costs. However, because of the wide variation among plants in the amount of the foreman's or superintendent's time devoted to seed processing, it was necessary to omit his salary from the overhead labor costs.

Determining Capital Investment: The general price level at the time the plant was constructed and equipped materially affected the total capital investment in plants of comparable size and design. Since this was true, it became necessary to relate all of the costs to a common base, and in order to do this some type of index was needed. Several indexes of building costs were available.[3] The one which seemed most suitable was an index of the cost of constructing commercial and factory buildings, prepared by E. H. Boeckh and associates.

No index was available on the cost of equipment used in seed processing plants, but the Bureau of Agricultural Economics (now the Agricultural Marketing Service) supplied an index of farm machinery costs. Since the machinery used in seed processing is very similar to that used on farms, it was concluded that this index would be representative of the seed processing equipment costs. (Both indexes are shown in Appendix Tables 1 and 2.)

By using the two indexes it was possible to show two factors which were considered important in determining cost of processing by those who participated in planning this study. First, it was possible to give an indication of the capital outlay required to construct a plant at about the present price level, an important phase of the study for those who may be contemplating the construction of a seed processing plant; and second, it showed the effect of the general price level, which existed at the time the plant was constructed and equipped, on the cost per hour of machine operation.

Allocation of Capital Expense: In order to determine areas in which individual plants were most efficient, costs were classified as: receiving, processing, shipping and miscellaneous. The fixed costs included depreciation, interest, taxes, insurance, and an allocation for building expenses chargeable to the classified function.

Depreciation, interest, taxes, and insurance were allocated on the basis of the original cost of the equipment used in each function. (A schedule of depreciation rates is given in Table 3 of the Appendix.) Interest charges were computed at 5 percent on one-half of the investment in buildings and equipment and on the total investment in land. Interest expense was charged each plant whether or not the firm had any interest bearing debts. Tax expense included only county and city property taxes and varied considerably among plants. However, no attempt was made to standardize the rates because of the complexity of tax assessment values and tax rates. Insurance expenses, on the other hand, was computed for all plants even though some carried little or no insurance. This expense item was based on insurance costs on 80 percent of the original cost of the buildings and equipment at the rate for the individual plant.

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[3] National Production Authority, **Construction and Building Materials, Statistical Supplement,** May 1952. United States Department of Commerce, Washington, D. C.

Building costs for approximately one-half of the storage space available in the plant was allocated to receiving and one-half to shipping. The processing and miscellaneous functions each received a building cost allocation based on the space used.

There was some objection to allocating utilities and other miscellaneous expenses on the basis of original investment in the equipment used in the three primary functions. However, any other approach did not appear to be practical and such an allocation was used. Actually there is justification for this allocation in that, generally, as the investment in equipment increased the amount of electricity (the major utilities item) required to operate the machinery increased. Equipment repair and maintenance costs were charged directly to the primary function involved.

Allocation of Labor Costs: As noted above certain of the labor costs were considered as overhead. However, no attempt was made to allocate this overhead labor between the primary functions. Instead, overhead labor costs and miscellaneous labor expenses were combined and added to the costs individually computed to obtain the total cost of processing. All unskilled labor was charged at the rate of 75 cents per hour. Two of the plants paid 90 cents per hour for one skilled laborer. In other instances, the pay was not above the 75 cent per hour used in computing the labor costs. The annual labor expense was not taken directly from the plants' books because of the practical impossibility of separating the labor expense for the supplementary enterprises. Instead, the time required to perform a given function was obtained and labor cost per hour was applied to compute the labor expense per hour of machine operating time.

Determination of Hours of Machine Operating Time: Data obtained on the quantity of seed cleaned during 1952 were related to the operators' estimate of the average quantity of each kind of seed cleaned per hour to determine the number of hours the machine was actually in operation.

Estimates on the average quantity of seed cleaned per hour were obtained from all but one plant. In this plant the operator felt that he was not well enough acquainted with the plant operation to make a valid estimate. Therefore, the average for three other plants having the same size screen and air machines was used.

Some Characteristics Of The Plants Studies

Date of Construction and Location: Three of the plants studies were located in the Delta, two in the Black Belt, two in the Clay Hills, and two in the Coastal Plains. Dates of construction ranged from 1940 to 1952, but most of them were constructed during the period of 1948 through 1951. In the group of plants having facilities for handling bulk seed, one was built in 1940, one in 1945, and one in 1951. Two of the plants in Group II were constructed in 1948 and one in 1949, with one adding additional storage facilities in 1949 and one making additions in 1952. For the group of small plants, one was built in 1943, and two in 1949, with one making additions in 1952.

Capital Investment: There was a relatively wide range in the capital investment in buildings and equipment within each group of plants and between groups. The averages for each group are shown in Table 1. The group of plants having facilities for receiving seed in bulk (Group I) had a total capital investment about two and one-half times as great as Group II. However, based on the estimate of the total costs chargeable to seed processing, Group I was only about one and three-fourths as great as Group II.

The total outlay of capital is an important item, since it is highly probably that the facilities would be necessary to handle the seed processed by the plant during peak seasons. However, the fact that the owners were able to utilize the facilities for other enterprises during periods when the seed processing equipment was not in use must also be taken into consideration. The owners undoubtably saw this possibility when planning the plant and were influenced considerably in their decisions relative to the size of the facility to build. It will be noted that the average floor space chargeable to seed processing by Group I and II was approximately equal, reflecting the space requirements for machines of approximately the same size and about the same floor space for storage.

The most significant difference in the capital investment for Groups I and II was in the cost of receiving equipment. Group I had an average total capital investment in this item of $12,075; whereas Group II averaged only $929. The average investment in receiving equipment chargeable directly to seed processing was $8,371 and $674 for Group I and II, respectively.

Facilities for receiving seed in bulk included truck or wagon scales, truck hoists and dumping pits, elevators for lifting seed, and some type of conveyor system. All plants in Group I had truck scales 40 feet or more in length; two had truck hoists and dumping pits; and one had an outside pit into which seed were shoveled through grain doors or over the side of the truck. Each conveying system was different. One plant lifted seed and let them flow by gravity into storage bins or into the holding bin over the cleaner. Seed could be transferred from bins near the main elevator to those most distant from the main elevator by letting them flow by gravity into another elevator where they were lifted and permitted to flow into any of the bins which could not be reached from the main elevator. One plant transferred seed from the dumping pit by a screw conveyor system either into storage bins or into the holding bins above the cleaning machine. The other plant lifted seed from the dumping pit onto a belt conveyor and in turn, into storage bins or to the holding bin over the cleaner.

Differences in investment in processing machinery reflect, for the most part, differences in the cost of holding bins for different plants and a bagging bin in one plant. In addition, costs of installing machines were somewhat higher for plants in Group I than in Group II. Plants in Group II had holding bins over the machines but they were relatively small and generally of cheaper construction than those in Group I.

Investment in shipping equipment made up a relatively small share of the total. Group I was higher since a proportion of the total cost of the conveyor system of one plant and of the cost of a motor lift in another plant was charged to shipping. On the other hand, for Group II about the only equipment included was the platform scale for weighing the cleaned, bagged seed and a proportional share of the cost of bag trucks and other similar equipment.

Investment in miscellaneous equipment included both office and laboratory equipment, and was considerably higher for plants in Group I than in Group II.

Table 1. Average capital investment in buildings and equipment by three groups of seed processing plants in Mississippi.

Item	Actual cash outlay when plants were constructed and equipped			Estimated cost if plant had been constructed and equipped in 1952.[1]		
	Group I	Group II	Group III	Group I	Group II	Group III
(a) Average total capital investment in all buildings and equipment used in seed processing.						
Buildings and land	$25,750	$11,292	$2,892	$33,586	$12,882	$3,499
Receiving equipment	12,075	929	18	15,252	950	24
Processing equipment	10,301	7,169	1,970	15,536	8,189	2,587
Shipping equipment	1,139	68	70	1,659	84	87
Miscellaneous equipment	1,005	305	-------	1,625	343	-------
Total:	$50,270	$19,763	$4,950	$67,658	$22,448	$6,197
Square feet of floor space in buildings	9,536	4,699	2,560	9,536	4,699	2,560
(b) Average capital investment chargeable to the seed processing operation.						
Buildings and land	$14,403	$11,292	$2,892	$19,635	$12,882	$3,499
Receiving equipment	8,371	674	18	9,612	686	24
Screen and air machine[2]	7,456	5,036	1,737	11,633	5,826	2,347
Shipping equipment	481	68	70	656	84	87
Miscellaneous equipment	605	305	-------	958	343	-------
Subtotal:	$31,316	$17,375	$4,717	$42,494	$19,821	$5,957
Other processing equipment	2,845	2,133	233	3,902	2,363	240
Total:	$34,161	$19,508	$4,950	$46,396	$22,184	$6,197
Square feet of floor space in buildings charged to seed processing	4,607	4,699	2,560	4,607	4,699	2,560

[1] Costs for 1952 based on indexes of building costs and of farm machinery costs. See text page 5 and Tables 1 and 2 of the Appendix.

[2] Includes the costs of installation and of (1) feeding and bagging elevators, (2) holding bins over the machines and (3) sacking bins (when these facilities were owned by the plant).

Most of the differences in this item was due to the amount of laboratory equipment used by the respective plants. For example, all plants in Group I had moisture testers, whereas, none in Group II owned this item. Other items accounted for the remainder of the differences.

Total capital investment in buildings and equipment for plants in Group III was relatively low. The plants were housed in adequate, low-cost buildings of sufficient size to accomodate only one screen and air machine. One plant added a dodder mill in 1951, but it was not to any appreciable extent during either 1951 or 1952.

Labor Required to Perform Various Functions Within the Plant: Labor required to perform different tasks within the plant varied greatly among the plants studied. Some variation was due to differences in the amount of labor-saving equipment in the plant, some to the arrangements of machinery, and some to variations in the efficiency of labor. From the standpoint of maximum usefulness of the findings in this study, the latter differences entered as a limiting factor. For example, one plant was conspicuous in the inefficient use of labor. Although the amount of labor-saving equipment in the plant should have made possible substantial savings, labor was used so inefficiently that actually more was required to perform some of the functions in the plant than in plants without labor-saving devices.

There was the alternative of not using the data for the plant with such inefficient labor but such action would have defeated, to an extent, the purpose of the study. Instead, the data were retained and are included in the averages which follow. However, attention is directed in the text to the time saved with the maximum labor efficiency which was observed in the plants. This attention gives the needed emphasis to the importance of the efficiency of labor on the cost of processing.

For the purpose of comparison between Groups I and II, the labor required to perform the major functions within the plant was classified as receiving, processing, and shipping.

Receiving labor included that required to get seed from the farm truck to the machine, but did not include labor required to dump seed into the feed elevator of the screen and air machine. For example, for seed received in bulk by plants having bulk handling facilities and transferred to bulk storage, the labor time actually required to get the seed dumped into the pit and transferred to the storage bin was counted. Then, later, when these seed were transferred to the machine, labor time was computed again. This labor time was translated into pounds of product handled per man minute of labor expended. The pounds of products handled per man minute was divided into the weighted average quantity of seed cleaned per hour by the plants to obtain the man minutes of receiving time per hour of machine operating time. Since all of the seed received by the plant were not transferred to plant storage but were cleaned as they were received, man minutes required for receiving per hour of machine operation were broken down to show the time required to receive under each condition. The same procedure was followed for all of the plants.

Processing labor included that required to dump seed into the feed elevator, the labor used to bag off, weigh, and sew the bags, and that required in the general supervision of the machine operation. The labor required in processing per hour of machine-operating time was based on timed observations.

Shipping labor as the term is used in this study, included all labor required to stack the seed from the platform scales onto the bag truck or motor lift pallet, to move into the warehouse and stack, and to move from the warehouse to the farm truck. It was assumed that there would always be one man from the farm truck to assist in stacking the

Table 2. Average number of man minutes required per hour of machine operating time at specific functions, two groups of seed processing plants in Mississippi.[1]

Function	Using weighted average quantity cleaned by the plants during 1952		Using same quantity for each group	
	Group I	Group II	Group I	Group II
Receiving:				
When seed are transferred directly to machine:				
Bulk	13.4	......	12.0	......
Bagged	(23.4)[2]	23.8[3]	(21.2)[2]	30.0[3]
When seed are transferred to storage and later to the machine:				
Bulk	(18.9)[2]	......	(17.1)[2]	......
Bagged	(46.2)[2]	(44.8)[2]	(42.2)[2]	(52.7)[2]
Processing:	121.0	162.0	121.0	162.0
Shipping:				
Bagged seed loaded direct from machine to farm truck	(12.1)[2]	(14.2)[2]	(11.0)[2]	(15.5)[2]
Bagged seed stocked in warehouse, then loaded on truck	23.6	35.2	21.5	38.5
Total	158.0	221.0	154.5	230.5
Weighted average quantity of seed cleaned per hour (pounds)	2,182	1,831	2,000	2,000

[1] Does not include any time spent for clean-up and change-over between lots of seed.

[2] Numbers in parenthesis are not included in the totals.

[3] Includes time data for a relatively small amount of seed received in bulk and dumped at the machines.

seed on the truck and his labor was not included in the time computations. Labor required for shipping was translated into the requirements per hour of machine operation by the same procedure as for receiving.

Apparently the greatest reduction in labor required per hour of machine operating time for Group I over Group II was in the labor required to transfer seed to the cleaning machine from bulk storage in Group I plants as compared with bagged storage in Group II plants, Table 2. There was a wide variation in the amount of labor required to perform this function by the plants within Group I, but there was relatively little difference among the plants within Group II. The differences among plants within Group I were due primarily to two factors—very inefficient labor in one plant and self-cleaning versus flat-bottom storage bins in the other two plants. The time data indicated that with efficient use of labor and with self-cleaning storage bins the labor time required to transfer seed from storage to the cleaner could be reduced by at least 50 percent. The most important factor was labor efficiency in the one plant previously mentioned.

The labor required to transfer seed from bagged storage to the cleaner was about the same for Group I as for Group II but was not very important for Group I from the standpoint of the total cleaning time, because a relatively small proportion of their receipts was in bags.

The difference in the processing labor required per hour of machine operating time between the two groups was due to several factors. These factors included (1) the labor required to dump bagged seeds into the feed hopper, (2) the labor required to sew the bags of cleaned seed, and (3) the larger holding bins and bagging bins in Group I permitted more freedom of movement, i. e., sometimes made it possible for one man to perform two tasks instead of only one.

The labor required to sew the bags of cleaned seed varied considerably among plants. Generally speaking the use of a good sewing machine, hanging above the platform scale and counter balanced, should replace one laborer when cleaning such seeds as roughpeas or oats. The machine is also an important item in saving time with seed which are cleaned at a slower rate, especially when, as a result, the man who would be employed with hand sewing can perform other routine tasks. However, here again the problem of inefficient labor entered into the time data. One plant with a small sewing machine actually spent more time sewing than some of the plants using all hand sewing. Ordinarily the man who bagged off could also weigh and sew the bags (for most commodities) when sewing with a machine, whereas, when the bags were hand sewed, one man bagged off and weighed and another sewed the filled bags. The man who did the hand sewing could generally be able to keep up with the seed which ran relatively fast, and would have time for other tasks when sewing seed which ran slowly. For the plant in question, however, even with the sewing machine the two men tending the machine often did not keep up, and had to be helped.

Larger holding bins over the machines and the use of a large bagging bin by one plant in Group I permitted much more flexibility in the use of the labor force. For example, with a large holding bin and a relatively large bagging bin one man could dump bagged seed and in most cases assist in bagging off cleaned seed; and, for seed which cleaned slowly, could perform both operations. On the other hand, without the holding bins, it was necessary to keep one man for each job. Holding bins were essential for plants with facilities for receiving seed in bulk.

In terms of the total time spent on processing, two plants in Group I used about one and one-half man hours of labor per hour of machine operating time, but one used almost three hours. This difference was due, for the most part, to the problem of inefficient labor in one plant: Two of the plants in Group II used about two man hours of labor per hour of machine time and one used almost four hours. For the plants in this group the difference was due to several factors. Among them were: (1) The plant using almost four hours used one man to dump bagged seed or scoop bulk seed into the feed hopper, one man to bag off, one man to sew, and the owner spent almost full time supervising or doing odd tasks around the machines. It should be noted here, however, that with his arrangement of machines, the same labor force could clean, scarify, and reclean seed (which required scarification) without any apparent decrease in the volume of seed cleaned. In this respect the plant was more efficient than any of the observed plants, if these other operations were carried on with the cleaning operation. These data do not reflect this over-all increase in plant efficiency since the study was made to determine the cost of operating the "primary" machine in the plant. (2) One plant in Group II, using about two hours of labor per hour of machine operation on the processing function, had this relatively low rate of labor use primarily because the seed were received in bulk and fed into the feed elevator of the machine by the use of an auger. The time for the one man employed in this operation was charged to receiving. If the seed had been dumped from bagged storage another laborer would have been required. (3) The third plant in this group cleaned seed at a relatively slow rate throughout the period the time data were taken. Therefore, one man bagged and sewed without difficulty and one man dumped the bagged seed into the feed elevator and performed other tasks around the machine. The use of the average for three plants in Group II seems to give a representative figure for each plant when consideration was given to the factors which could not be measured during the period the time data were taken.

The shorter time required for the shipping function by the plants in Group I was primarily the result of the use by one plant of a motor lift for stacking in the warehouse and for loading out. The rate for stacking in the warehouse per man minute of labor expended was about four times as great when the motor lift was used and for loading on the farmer's truck it was about one-third to one-half greater. (This computation assumed that two men from the plant would always be required for loading out when using the motor lift. One would serve as the motor lift operator and the other would help stack from the pallet onto the farm truck.)

Clean-up Time: From the standpoint of the labor actually required to operate a seed-cleaning plant, that required for clean-up between different lots of seed was the most important limiting factor in this study. The labor required to clean-up varied more between plants than for any other operation. For example, the only clean-up done by some of the plants was to pull the screens, brush them off, let the machine run for two or three minutes with the screens out, sweep up around the machine, move the screenings for the whole lot into the warehouse (or set outside the plant) and replace the screens. On the other hand, one plant was extremely meticulous in cleaning up, particularly following a lot of seed which was known to contain any noxious weeds. The screens were pulled and the machines operated for a few minutes. After this, all the machine was cleaned with a portable electric blower, and every seed was cleaned from the screens. The blower was used to clean from behind each elevator cup on both the feed elevator and the bagging elevator, and care was taken to clean up well around the machine. The plant owner estimated that he used an average of twelve man hours to clean-up between lots of seed.

There was, in addition to the wide variation in labor requirement among plants, a wide variation among different lots of seed which were cleaned by the individual plants. Most of the operators pointed out, and it was observed to an extent, that between lots of the same kind of seed there was ordinarily only a limited amount of clean-up needed, but for different kinds of seed more labor was required. Even in the latter case the order in which the seed were cleaned affected the time for clean-up, that is, (for example) whether oats were following clover or clover was being followed by oats.

With this background one can readily see the practical impossibility of determining the average clean-up labor required per hour of machine operating time. However, failure to compute the time does not indicate a failure to recognize the importance of this operation on the total cost of processing. On the other hand, an operator should be able to get some idea of this cost for his individual plant by estimating the average labor required to clean-up and the number of hours required to clean an average lot of seed. By doing this he can divide the variable labor cost for the average clean-up period by the number of hours he expects to run before changing over again and add this to the other costs as computed in this study and obtain an estimate of the total costs of processing for each hour of machine operating time.

Average Number of Hours of Machine Operation: The plants in Group I averaged 1,507 hours of machine-operating time during 1952 and cleaned a weighted average of 2,182 pounds of seed per hour of machine-operating time. The quantity of seed cleaned by the plants varied considerably but averaged about 2.8 million pounds during 1952.

The plants in Group II averaged only 698 hours of machine-operating time and cleaned a weighted average of 1,831 pounds of seed per hour. The plants in this group averaged only slightly over 1.1 million pounds of seed cleaned during 1952, but this relatively low average was due in part to the fact that one plant cleaned only about 200 thousand pounds during the year. However, of this 200 thousand pounds, a high proportion was small seeded legumes and other small seeds which cleaned at a slow rate and the hours of machine operation for this plant compared more favorably with the average for the group.

Generally speaking, the rate at which the different kinds of seed were cleaned by plants with same size machines did not vary significantly. Therefore, the difference in the average quantity of seed cleaned per hour is explained, for the most part, by the difference in the relative quantities of seed cleaned by the plants which cleaned at a slow rate and those which cleaned at a more rapid rate. A simple example will illustrate this point. Let us assume that Plants A and B each cleaned two million pounds of seed. Plant A cleaned 500 thousand pounds of seed that cleaned at an average rate of 500 pounds per hour and 1,500 thousand pounds that cleaned at an average rate of 3,000 pounds per hour. The weighted average for this plant would be 1,333 pounds per hour. On the other hand, let us assume that the proportion was one million pounds of each type of seed cleaned by Plant B. The weighted average for Plant B would be 857 pounds per hour.

The number of hours of machine operation for the plants indicated that there was considerable idle time for the machines even when operating at or near capacity. As noted above, the time required for clean-up between lots of seed was a very important factor in this respect, but other factors also accounted for some of this idle machine time. Probably the most important one, other than clean-up, for most of the plants was time that the machine was stopped while the labor force was working on the supplementary enterprise. Although this time was not chargeable to the seed processing operation there was, nevertheless, the fact that the machine was idle. The plant operators often shut down to receive and ship seed, which accounts for some of the idle machine time.

Cost of Plant Operation

Annual Investment Costs: The annual investment costs[4] for the plants studied are shown in Tables 3 and 4. The data in Table 2 show a separate item for buildings and land, whereas, in Table 4 these costs have been allocated to the three primary functions.

The differences in the investment costs reflect to a large extent the same to the capital investment. The greatest difference in the two groups was in the investment cost of receiving equipment. Group I had a total investment cost of $2,091 while Group II had a cost of $397 for this item, Table 4. The amount of the receiving costs chargeable to seed processing was also considerably higher for Group I than for Group II, even though a much greater proportion of the total for Group I was allocated to other enterprises. The average annual investment costs for the screen and air

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[4] Investment costs as used in this study refer to the proportion of fixed cost attributable to capital investment. Fixed costs not included in investment cost consist primarily of salaried employees including management.

Table 3. Average annual investment costs for three groups of seed processing plants in Mississippi.

Item	Costs based on prices prevailing when the plants were constructed and equipped.			Estimated costs if plants had been constructed and equipped in 1952.[1]		
	Group I	Group II	Group III	Group I	Group II	Group III
(a) Average total annual fixed costs for all buildings and equipment used in seed processing.						
Buildings and land	$2,023	$ 855	$220	$2,609	$ 956	$269
Receiving equipment	1,166	83	1	1,637	85	1
Processing equipment	1,192	804	238	1,773	904	306
Shipping equipment	152	7	4	221	9	7
Miscellaneous equipment	117	35	......	185	39	......
Total	$4,650	$1,784	$465	$6,425	$1,993	$583
(b) Average annual fixed cost chargeable to the seed processing operation.						
Buildings and land	$1,051	$ 855	$220	$1,433	$ 955	$269
Receiving equipment	512	60	1	610	61	1
Screen and air machines[2]	829	561	213	1,285	639	280
Shipping equipment	58	7	6	81	9	8
Miscellaneous equipment	71	35	......	111	39	......
Subtotal:	$2,521	$1,518	$440	$3,520	$1,704	$558
Other processing equipment	363	243	25	488	265	26
Total	$2,884	$1,761	$465	$4,008	$1,969	$584

[1] Costs for 1952 based on indexes of building costs and of farm machinery costs. See page 5 and Tables 1 and 2 of the Appendix.

[2] Includes the fixed costs of (1) feeding and sacking elevators, (2) holding bins over the machines, and (3) sacking bins (when these facilities are owned by the plant).

Table 4. **Average annual investment costs by type of operation for three groups of seed processing plants in Mississippi.**

Item	Costs based on prices prevailing when the plants were constructed and equipped.			Estimated costs if plants had been constructed and equipped in 1952.[1]		
	Group I	Group II	Group III	Group I	Group II	Group III
(a) Average total annual fixed costs for all buildings and equipment used in seed processing.						
Receiving	$2,091	$ 397	$ 56	$2,800	$ 433	$ 70
Processing	1,480	991	277	2,230	1,111	354
Shipping	962	357	131	1,201	405	159
Miscellaneous	117	40	-----	186	45	-----
Total:	$4,650	$1,785	$464	$6,427	$1,994	$583
(b) Average annual fixed cost chargeable to the seed processing operation.						
Receiving	$ 959	$ 374	$56	$1,203	$ 408	$ 70
Screen and air machines[2]	1,018	689	250	1,582	782	327
Shipping	426	357	131	539	405	159
Miscellaneous	71	49	-----	111	45	-----
Subtotal:	$2,474	$1,460	$437	$3,435	$1,640	$556
Other processing equipment	410	301	27	647	329	27
Total:	$2,884	$1,761	$464	$4,082	$1,969	$583

[1] Costs for 1952 based on indexes of building costs and of farm machinery costs. See page 5 and Tables 1 and 2 of the Appendix.

[2] Includes the fixed costs of (1) feeding and sacking elevators, (2) holding bins over the machines, and (3) sacking bins (when these facilities are owned by the plant).

machines were $329 more for Group I than for Group II. This difference was due for the most part to differences in cost of installation and of supplementary equipment such as holding bins and elevators.

The effect of the general price level on the cost of operation can be seen by comparing the annual investment costs based on prices prevailing at the time the plant was constructed and equipped, with the estimated annual investment costs if the plant had been constructed and equipped in 1952, Table 4. For example, the total investment cost for Group I increased from $4,650 to $6,425, or an over-all increase of about 38 percent. The total investment costs for Group II increased from $1,785 to $1,994 or an over-all increase of about 12 percent.

Overhead Labor Cost

Attention has been directed to the fact that many of the operators kept at least one laborer as a nucleus for his seasonal labor force. Four plants actually kept two laborers on a year-round basis, but each of the operators pointed out that they were able to do this only because their services could be utilized by the supplementary enterprise. Therefore, the overhead labor cost included only the wages of one laborer.

The annual overhead labor cost was based on the assumption that during the rush season the laborer would work 60 hours per week, but during seasons when only a relatively small quantity of seed was being cleaned he would work only 40 hours per week. The number of months which the plants were operated at capacity varied among the plants but an average of five months at capacity was used as the basis for computing this cost item. The minimum wage was considered most satisfactory for use even though two of the plants paid the most experienced men 90 cents per hour, and some did not pay the minimum. During the rush season, therefore, the weekly wage would be $52.50 (75 cents for 40 hours and $1.125 for 20 hours) and during the remaining weeks the wage would be $30.00 or an annual wage of $2,055.

The salary for the foreman, or plant superintendent and/or the owner, is also an overhead labor cost. However, this item was omitted from the computation because of the practical impossibility of assigning a value to the time which the various men spent with seed cleaning. It was felt that, since there was such a wide variation here, it would be better to compute the cost of processing exclusive of this cost and let the individual plant operator make charges for this particular item of expense. The time spent by the plant owner or superintendent varied from casual supervision to a very active participation in the work within the plant. The time which these men worked was included in determining the time spent performing the various operations in the plants, but the labor cost was computed at the rate for unskilled labor. There was only one plant in which this method of computation made any material difference, and when considered in terms of an average this effect was minimized.

Miscellaneous Costs

The miscellaneous costs shown in Table 5 include only the expenses incurred during 1952 which were considered chargeable to the seed-cleaning or processing operation. Most of the difference in the total miscellaneous costs for Group I and Group II was the result of higher maintenance and repair costs and the cost of insurance on inventory for Group I. One of the plants in Group II carried insurance on inventory for the farmers who requested it but it was not considered a direct cost to the plant since the cost of the insurance was included in the cleaning charges. If a farmer did not desire to have his seed insured while they were being held in plant storage he signed a statement to that effect.

Summary of Fixed and Miscellaneous Costs

The difference in the total costs (except variable labor) of operating the "primary" machine for Group I was about 45 percent higher than for Group II, Table 6. It should be noted that the investment cost here included only the proportion of the total which was chargeable to the seed cleaning operation, and also, that this same basis was used for computing the miscellaneous costs.

The estimated total costs (except variable labor) if the plant had been constructed and equipped in 1952 is also summarized in Table 5. Based on this estimate the costs for Group I were almost 60 percent greater than Group II. The comparison of the estimates and the actual average costs gives an indication of the effect of the general level of prices prevailing when the facility was constructed and equipped.

Cost Per Hour of Machine Operation

It was pointed out previously that the costs have been computed with the view to determining the cost per hour of operation for only the screen and the air machine. The fixed costs for all other processing equipment, including a building cost allocation are shown in Table 4. However, no allocation was attempted for the receiving equipment, shipping equipment, or miscellaneous costs. The costs per hour of operation for the screen and the air machine included the total costs of these items which were considered chargeable to the seed-processing operation.

The labor cost for one man was included in the cost item of overhead labor. Therefore, the variable labor costs have been computed on the basis of the man minutes required per hour of macine-operating time, minus 60 minutes. For plants in Group I, variable labor

Table 5. Average annual miscellaneous costs for the seed processing enterprise, three groups of seed processing plants, 1952.

Item	Group I	Group II	Group III
Utilities	$ 653	$558	$ 87
Maintenance and repairs	791	162	75
Insurance of inventory	206	......	......
Other miscellaneous expense	200	177	......
Total	$1,850	$897	$162

Table 6. Summary of costs (except variable labor) chargeable to the seed processing enterprise,[1] three groups of seed processing plants.

Cost Item	Costs based on prices prevailing at the time the building was constructed and equipped.			Estimated if plant had been constructed and equipped in 1952.[2]		
	Group I	Group II	Group III	Group I	Group II	Group III
Investment costs	$2,474	$1,460	$465	$3,435	$1,641	$583
Overhead labor	2,055[3]	2,055[3]	......	2,055[3]	2,055[3]	......
Miscellaneous	1,850	987	162	1,850	897	162
Total	$6,379	$4,412	$627	$7,340	$4,593	$745

[1] Only the screen and air machine included in processing equipment.

[2] Estimates of costs for 1952 based on indexes of construction costs and of farm machinery.

[3] Does not include any charge for the time spent on the seed processing operation by the foreman and/or owner.

requirements per hour of machine-operating time amounted to 98 minutes for seed received in bulk and transferred directly to the machine, Table 6. The plants in Group II required 161 minutes, above the overhead labor, for each hour of machine-operating time. If the same volume (2,000 pounds) were cleaned per hour by each group, the variable labor would have been 94 and 170 minutes, respectively, for Group I and Group II. The labor required for the various functions when seed are all received and stored is also shown in Table 2. Attention should be given to the fact that the time computed here does not include an allowance for time required for clean-up and change-over or for any idle time by the labor force. Also of importance is the fact that the overhead labor does not include an allowance for the owner and/or foreman. Reasons for omitting these items have been pointed out on page 16.

Tables 7 and 8 show costs for the different groups of plants when operating at various levels of capacity ranging from 250 to 2,000 hours of machine operation per year. The effect of the number of hours of operation on the average total fixed costs per hour for the screen and the air machine in each of the three groups is illustrated in Table 7. This table reveals several things which are important. Among these points are: (1) When a plant has high fixed costs, such as those in Group I, it is imperative that it operate at a relatively high capacity in order to reduce the cost per hour of operation; (2) The plants in Group III cannot afford to install other labor-saving equipment unless the volume handled can be increased substantially, and (3) The level of prices prevailing at the time the plants were constructed and equipped will materially affect the cost of operation. For example, based on prices prevailing at the time the plants were constructed and equipped, the fixed cost for Group I, operating at an annual capacity of 700 hours, was estimated at \$3.53 per hour of machine operating time; however, the estimated cost, if the plants had been constructed and equipped in 1952, was \$4.91 per hour—a difference of \$1.38 per hour of operation.

The labor costs (excluding a charge for the owner and/or foreman) are included in the costs shown in Table 8 for Group I and II. The most important point to note from this table is that each group has the most economical balance between labor and fixed costs at their present level of operation. Based on prices prevailing at the time the plants were constructed and equipped when operating 700 hours per year, Group II has a cost of \$8.58 per hour and Group I has a cost of \$8.91 per hour. On the other hand, at an annual rate of 1,500 hours, the plants in Group I had a cost of \$5.46 per hour and Group II had a cost of \$5.89 per hour. Although plants in Group I had considerably lower costs per hour of operation at their present level of operation (\$5.46 per hour for 1,500 hours) than plants in Group II (\$8.58 for 700 hours) these data emphasize the fact that unless the plants in Group II could increase the volume of seed cleaned it would not be economical for them to put in additional labor-saving equipment.

The estimates given in Table 8 (b) indicate that if the plants had all been constructed in 1952, those in Group II would have had lower costs at even 1,500 hours of annual machine operation. At the 700 hour level the cost for Group II was substantially lower, \$8.83 as compared with \$10.29 for Group I, and at the 1,500 hour level the comparable figures were \$6.01 for Group II and \$6.10 for Group I.

For those persons who want more information on costs, Tables 4 and 5 are included in the Appendix. Table 4 shows what the total investment cost per hour of operation would have been if the plant operators had not been able to offset

Table 7. Average investment costs per hour of machine operation for the screen and air machine when operating at different levels of capacity, three groups of seed processing plants in Mississippi.[1]

Group and cost item	Average investment costs	Cost per hour when operating at an annual capacity of					
		250 hours[2]	500 hours[3]	700 hours	1,000 hours	1,500 hours[4]	2,000 hours
	(a) Based on prices prevailing when the plants were constructed and equipped.						
Group I:							
Receiving	$ 959	$3.84	$1.92	$1.37	$ .96	$ .64	$ .48
Processing	1,018	4.07	5.04	1.45	1.02	.68	.51
Shipping	426	1.70	.85	.61	.43	.28	.22
Miscellaneous	71	.28	.14	.10	.07	.05	.04
Total:	$2,474	$9.89	$4.95	$3.53	$2.47	$1.65	$1.25
Group II:							
Receiving	$ 374	$1.49	$ .74	$ .53	$ .37	$ .25	$ .18
Processing	689	2.74	1.37	.98	.69	.46	.34
Shipping	357	1.43	.72	.51	.36	.24	.18
Miscellaneous	40	.16	.08	.06	.04	.03	.02
Total:	$1,460	$5.82	$2.91	$2.08	$1.46	$ .98	$ .72
Group III:							
Receiving	$ 56	$ .22	$ .11	$ .08	$ .06	$ .04	$ .03
Processing	250	1.00	.50	.36	.25	.17	.12
Shipping	131	.52	.26	.19	.13	.09	.06
Total:	$ 437	$1.74	$ .87	$ .63	$ .44	$ .30	$ .21
	(b) Estimated if plants had been constructed and equipped in 1952.[5]						
Group I:							
Receiving	$1,203	$ 4.81	$2.40	$1.72	$1.20	$ .80	$ .60
Processing	1,582	6.33	3.16	2.26	1.58	1.05	.79
Shipping	539	2.16	1.08	.77	.54	.36	.27
Miscellaneous	111	.44	.22	.16	.11	.07	.06
Total:	$3,435	$13.74	$6.86	$4.91	$3.43	$2.28	$1.72
Group II:							
Receiving	$ 408	$ 1.63	$ .82	$ .58	$ .41	$ .27	$ .20
Processing	782	3.13	1.56	1.12	.78	.52	.39
Shipping	405	1.62	.81	.58	.40	.27	.20
Miscellaneous	45	.18	.09	.06	.04	.03	.02
Total:	$1,640	$ 6.56	$3.28	$2.34	$1.63	$1.09	$ .81
Group III:							
Receiving	$ 70	$ .28	$ .14	$ .10	$ .07	$ .05	$ .04
Processing	327	1.31	.66	.47	.33	.22	.16
Shipping	159	.64	.32	.23	.16	.11	.08
Total:	$ 556	$ 2.23	$1.12	$ .80	$ .56	$ .38	$ .28

[1] The total receiving, shipping and miscellaneous costs "chargeable to seed processing" are included here, but only the fixed costs for the screen and air machine are included under processing. See text page 13.

[2] Approximate average number of hours actually operated by the plants in Group III.

[3] Approximate average number of hours actually operated by the plants in Group II.

[4] Approximate average number of hours actually operated by the plants in Group I.

[5] Estimates based on indexes of construction costs and farm machinery costs. See text page 5 and Appendix Tables 1 and 2.

Table 8. Total cost per hour of machine operating time for the screen and air machine, two groups of seed processing plants in Mississippi when operating at different levels of capacity.[1]

Group and cost item	cost of item Average total	Costs per hour when operating at an annual capacity of				
		500 hours	700 hours[2]	1,000 hours	1,500 hours[3]	hours 2,000
(a) Fixed costs based an prices prevailing at the time when the plants were constructed and equipped.						
Group I:						
Investment costs	$2,474	$ 4.95	$ 3.53	$2.47	$1.65	$1.25
Overhead labor	2,055[4]	4.11	2.94	2.06	1.37	1.03
Misc. costs	1.850[5]	1.23	1.23	1.23	1.23	1.23
Subtotal:	$6.379	$10.29	$ 7.70	$5.76	$4.25	$3.51
Variable labor @ 75¢ per hour[6]		1.21	1.21	1.21	1.21	1.21
Total:		$11.50	$ 8.91	$6.97	$5.46	$4.72
Group II:						
Investment costs	$1,460	$ 2.92	$ 2.09	$1.46	$ .97	$ .73
Overhead labor	2,055[4]	4.11	2.94	2.06	1.37	1.03
Misc. costs	897[5]	1.28	1.28	1.28	1.28	1.28
Subtotal:	$4,412	$ 8.31	$ 6.31	$4.80	$3.62	$3.04
Variable labor @ 75¢ per hour[6]		2.27	2.27	2.27	2.27	2.27
Total:	$ 10	$10.58	$ 8.58	$7.07	$5.89	$5.31
(b) Estimated fixed costs if plant had been constructed and equipped in 1952.[5]						
Group I:						
Investment costs	$3,435	$ 6.87	$ 4.91	$3.44	$2.29	$1.72
Overhead labor	2,055[4]	4.11	2.84	2.06	1.37	1.03
Misc. costs	1,850[5]	1.23	1.23	1.23	1.23	1.23
Subtotal:	$7,340	$12.21	$ 9.08	$6.73	$4.89	$3.98
Variable labor @ 75¢ per hour[6]		1.21	1.21	1.21	1.21	1.21
Total:		$13.42	$10.29	$7.94	$6.10	$5.19
Group II:						
Investment costs	$1,641	$ 3.28	$ 2.34	$1.64	$1.09	$ .82
Overhead labor	2,055[4]	4.11	2.94	2.06	1.37	1.03
Misc. costs	897[5]	1.28	1.28	1.28	1.28	1.28
Subtotal:	$4,593	$ 8.67	$ 6.56	$4.98	$3.74	$3.13
Variable labor @ 75¢ per hour[6]		2.27	2.27	2.27	2.27	2.27
Total:		$10.94	$ 8.83	$7.25	$6.01	$5.40

---

[1] The total receiving, shipping and miscellaneous costs "chargeable to seed processing" are included here, but only the fixed costs for the screen and air machine are included under processing. See text page 13.

[2] Approximate average number of hours actually operated by the plants in Group III.

[3] Approximate average number of hours actually operated by the plants in Group II.

[4] Approximate average number of hours actually operated by the plants in Group I.

[5] Estimates based on indexes of construction costs and farm machinery costs. See text page 5 and Appendix Tables 1 and 2.

[6] Variable labor 97.1 man minutes per hour of machine operating time for the plants in Group I and 181.9 man minutes per hour of machine operating time for the plants in Group II.

part of their investment costs by having supplementary enterprises. They were able to use part of the seed-processing facilities in these supplementary enterprises during seasons when they were not being used to process seed. Table 5 contains a cost schedule similar to the one in Table 7, but all of the labor is assumed to be variable. In studying the table, the assumptions on which the data are based should be noted. These assumptions are given in Footnote 3 of the Appendix Table 5. For plants without an overhead labor cost, Appendix Table 5 may be most useful as a guide. However, as in the other computation, there was no allowance for clean-up and change-over time or for the owner and/or the foreman.

Adjustment Which Would Provide More Efficient Operations

The preceding data have emphasized the relationship of the volume of seed cleaned to the cost per hour of machine operation. However, the time data taken during the course of this study provide a basis for pointing out other ways of increasing efficiency without increasing the volume of seed handled. In addition, there are areas where changes will bring increased efficiency as the volume of seed handled is increased.

Several fundamental facts affecting processing cost should be pointed out. They are probably obvious to those already operating seed-processing plants, but they may be less obvious to those considering the construction of a plant. The first of these is that each time a lot of seed is handled, the cost of processing is increased. Therefore, every effort should be made to hold to a minimum the number of times a lot is handled during the cleaning process. Another important consideration is that the most economical method of transferring seed from one point to another is by gravity flow. (Assuming, of course, that any economy thus gained is not offset by other higher costs, such as, excessive capital investment in relation to the volume of seed to be handled.) Still another point is that the elevation of the loading platform will materially affect the labor required for loading and unloading bagged products. Finally, but not necessarily least important, the time required to clean up between lots of seed should be considered before installing any additional equipment which is designed to reduce labor time in one area of the plant, while increasing the labor required for clean-up.

Since no time data were taken for the small plants in Group III, no specific recommendations can be made for increasing efficiency within this group. However, it is doubtful that they could economically add any substantial amount of labor-saving equipment with their present volume of operation. If these plant operators increase the volume of seed handled, then the same general methods of increasing efficiency would apply as those given for the plants in Groups I and II.

The plants similar to those studied in Groups I and II which do not have a truck hoist and dumping pit should consider this method of receiving for bulk seeds. Observations indicated that, with the average efficiency of labor employed, the volume of seed received per man minute of labor could be increased at least three times. One operator without a dumping pit was only one-half as efficient as those having a dumping pit; however, two operators with some facilities for handling bulk seed, but who did not have dumping pits were only about one-fourth as efficient. Part of this inefficiency was due to inefficient labor, but it could not all be attributed to this factor. The installation of the dumping pit should not be considered, however, if the volume of seed cleaned is not large enough so that the economics in labor will more than offset the additional fixed cost of the receiving equipment. In most cases the addition of a dumping pit would require that an elevator also be installed or alterations made on the one currently in use.

The most economical handling of bulk seeds requires that adequate storage facilities be provided and that these facilities be accessible to both the receiving and the processing equipment. There are many obstacles in the way of making specific recommendations for providing these facilities. As noted earlier in the report, each of the plants with facilities for handling bulk seed had a different method of transferring the seed to storage. Time data taken were not conclusive enough to determine exactly which method of transfer was most efficient but two observations require consideration. First, the gravity-flow method is undoubtedly more economical if the seed can be lifted high enough to flow freely into the storage bins, and second, the equipment should be relatively easy to clean.

There seems to be little doubt that, in most cases, it would be economical in the long run to provide storage bins with self-cleaning bottoms. The labor used to maintain the flow of grain and to clean out the flat bottom bin increased significantly the total labor required. Time data were not taken over a long enough period to give concrete information on labor required, but in attempting to add storage space by the use of flat bottom bins the operator should consider at least two factors. Probably the most important one is the estimated length of time which would be required to clean the bins during one season (using an average turnover based on actual or anticipated volume of seed to be cleaned) multiplied by the number of years which the facilities will be used. Another important factor is the size of the average lot of seed received. In many instances, the plants in Group I did not use all of the space in a storage bin because of the relatively small lots of seed being received. This factor indicates that the additional storage space afforded by flat bottom bins may not be as important as may seem to many operators.

A number of suggestions were offered by plant managers. Two of these suggestions seem worthy of mention although neither was in actual use. One of these was the use of a movable bottom with sloping sides which could be moved along a track above the transfer belt or auger and through which the flow of seed could be regulated. Another suggestion was the use of portable bins which would hold the average small lot of seed and which could be handled by the use of a motor (fork) lift.

For the plants with sufficient volume a motor lift should be considered for receiving bagged seed and for transferring bagged seed to storage and from storage to the farm truck. From the standpoint of the labor required the one plant using a motor lift stacked the seed in the warehouse about four times as fast as the other plants in both Group I and Group II. The other plants stacked the seed in storage at about the same rate, averaging less than 100 pounds per man minute of labor. The plant using the motor lift averaged about 400 pounds of seed per man minute. The savings were not as significant when transferring from storage to the farm truck since the driver usually waited for a pallet to be unloaded before returning for another load. Even then there was a considerable reduction in labor, particularly over the plant loading from ground level. In this instance the motor lift was almost three times as efficient as hand labor. Each of the four plants with "truck bed level" loading ramps loaded out about 150 pounds per man minute of labor, whereas the plant with the motor lift averaged almost 225 pounds. This compared with about 85 pounds for the plant with a ground level plant floor and without a motor lift.

A number of factors should be considered in arranging the machines within the plant. Apparently one of the most important factors in this respect is to provide for the continuous flow of seed through all of the machines used in the cleaning process. For example, if a series of machines are to be used for processing a specified lot of seed, the equipment should be so arranged that continuous flow can be accomplished without having to bag or transfer the seed to bulk storage and be brought back to the other machines at a later date. In providing arrangement for continuous flow of seed through the machines, two plants in the sample provided an interesting contrast. One of the plants, which used a two-screen machine as a scalper could scalp, scarify, clean over a four-screen machine, and transfer to a spiral or length separator without handling the seed after they were dumped into the feed elevator pit. Each of these machines could be by-passed and the seed bagged at any point along the cleaning process. At the other extreme, one plant had the screen and air machine which was used to clean most of the legume seed at one end of the plant building and the gravity table which was used to reclean much of the clover seed located at the opposite end of the building. The clover had to be bagged off and moved to the gravity table which increased the labor requirement significantly.

A holding bin above the screen machine and a large bagging bin provided for much more flexibility in the use of plant labor. Without these bins it was often necessary to keep one man dumping seed from bags into the machine and one man bagging. At least one-third to one-half of the laborer's time could be devoted to other tasks if the seed could be dumped and bagged more rapidly. This was particularly true with seed that cleaned at a relatively slow rate.

An electric bag sewing machine mounted above the bagging area will generally replace one man when cleaning seed that flow freely, such as oats and roughpeas. It was often impossible for one person to hand sew as fast as the seed were bagged. On the other hand, where the sewing machine was used efficiently on person could bag off and sew without any apparent difficulty.

APPENDIX

Table 1. Index numbers of prices paid by farmers for farm machinery, 1930-52.[1]

Year	Index 1910-14 = 100	Year	Index 1910-14 = 100
1930	152	1942	164
1931	150	1943	170
1932	142	1944	174
1933	138	1945	176
1934	144	1946	182
1935	148	1947	206
1936	150	1948	240
1937	153	1949	270
1938	158	1950	276
1939	155	1951	299
1940	153	1952	309
1941	155		

[1] Source: Bureau of Agricultural Economics, **Agricultural Prices,** October 27, 1950, page 41, for the years 1930 through 1949. Data for 1950 through 1952 are simple averages of the quarterly indexes taken from the respective issues of the same publication.

Table 2. Index numbers of commercial and factory building construction costs, 1930-52.[1]

Year	Index 1947-49 = 100	Year	Index 1947-49 = 100
1930	51.4	1942	60.8
1931	47.6	1943	63.2
1932	41.0	1944	67.5
1933	42.0	1945	71.6
1934	45.8	1946	78.1
1935	45.1	1947	91.7
1936	46.5	1948	103.6
1937	51.9	1949	104.8
1938	53.8	1950	109.5
1939	54.3	1951	117.9
1940	55.2	1952	121.9
1941	57.9		

[1] Source: E. H. Boeckh and Associates, Reported by National Production Authority, United States Department of Commerce, Washington, D. C., in Construction and Building Materials, Statistical Supplement, May, 1952, Page 34.

Table 3. Schedule of depreciation rates used in this study

	Percent
I. Buildings	
A. All buildings except wood construction	3
B. Wood construction	4
II. Equipment	
A. Scales	
1. Truck or wagon	3
2. Platform	4
B. Processing	6.7
C. Elevators	
1. Bucket	5
2. Chain	10
D. Conveyors	
1. Belt	6.7
2. Screw	10
E. Other	
1. Bag trucks	6.7
2. Bag sewing machines	6.7
3. Laboratory equipment	6.7
4. Stencil cutting machine	5
5. Truck hoist and dumping pit (combine)	5
6. Other miscellaneous	6.7
7. Motor lift and pallets	10

Table 4. Average investment costs per hour of operation for the major functions within the plant, when operating at different levels of capacity, three groups of seed processing plants in Mississippi.[1]

Group and cost item	Average investment costs	Cost per hour when operating at an annual capacity of					
		250 hours[2]	500 hours	700 hours[3]	1,000 hours	1,500 hours[4]	2,000 hours
	(a) Based on prices prevailing when the plants were constructed and equipped.						
Group I:							
Receiving	$2,091	$ 8.36	$ 4.18	$2.99	$2.09	$1.39	$1.05
Processing	1,480	5.92	2.96	2.11	1.48	.99	.74
Shipping	962	3.85	1.92	1.37	.96	.64	.48
Miscellaneous	117	.47	.24	.17	.12	.08	.06
Total:	$4,650	$18.16	$ 9.30	$6.64	$4.65	$3.10	$2.33
Group II:							
Receiving	397	1.59	.80	.57	.40	.27	.20
Processing	991	3.96	1.98	1.42	.99	.66	.50
Shipping	357	1.43	.72	.51	.36	.24	.18
Miscellaneous	40	.16	.08	.06	.04	.03	.18
Total:	1,785	7.14	3.58	2.56	1.79	1.20	.90
Group III:							
Receiving	56	.22	.11	.08	.06	.04	.03
Processing	277	1.11	.56	.40	.28	.19	.14
Shipping	131	.52	.26	.19	.13	.09	.07
Total:	464	1.85	.93	.67	.47	.32	.24
	(b) Estimated if the plants had been constructed and equipped in 1952.[5]						
Group I:							
Receiving	$2,800	$11.20	$ 5.60	$4.00	$2.80	$1.87	$1.40
Processing	2,230	8.92	4.46	3.19	2.23	1.49	1.12
Shipping	1,201	4.80	2.40	1.72	1.20	.80	.60
Miscellaneous	186	.75	.38	.27	.19	.12	.09
Total:	$6,427	$25.67	$12.84	$9.18	$6.42	$4.28	$3.21
Group II:							
Receiving	433	1.73	.86	.62	.43	.29	.22
Processing	1,111	4.44	2.22	1.59	1.11	.74	.56
Shipping	405	1.62	.81	.58	.40	.27	.20
Miscellaneous	45	.18	.09	.06	.04	.03	.02
Total:	1,994	7.97	3.98	2.85	1.98	1.33	1.00
Group III:							
Receiving	70	.28	.14	.10	.07	.05	.04
Processing	354	1.42	.71	.51	.35	.24	.18
Shipping	159	.64	.32	.23	.16	.11	.08
Total:	583	2.34	1.17	.84	.58	.40	.30

[1] Note: These data are shown primarily, for emphasis on what the overall investment cost per hour of plant operation would be if the operators of the seed processing plants did not have supplementary enterprises to help offset these investment costs. It should be noted that the cost per hour of machine operation for the screen and air machine shown in the following tables, allocate certain of these investment costs to other enterprises and also that the investment cost for processing equipment other than the screen and air machine are omitted. For definition of investment cost see footnote 4 page 13.

[2] Approximate average number of hours actually operated by the plants in Group III.

[3] Approximate average number of hours actually operated by the plants in Group II.

[4] Approximate average number of hours actually operated by the plants in Group I.

[5] Estimates based on indexes of construction costs and farm machinery costs. (See text page 5 and Appendix Tables 1 and 2.)

Table 5. A comparison of the investment[1] costs and labor costs per hour of machine operation for two groups of seed processing plants in Mississippi when operating at different levels of capacity.

Groups and function	500 hours			700 hours[2]			1,000 hours			1,500 hours[3]			2,000 hours		
	Investment costs	Labor costs[3]	Total	Investment costs	Labor costs[3]	Total	Investment costs	Labor costs[3]	Total	Investment costs	Labor costs[3]	Total	Investment costs	Labor costs[3]	Total
(a) Fixed costs based on prices prevailing when the buildings were constructed and equipped.															
Group I:															
Receiving	1.92	.18	2.10	1.37	.18	1.55	.96	.18	1.14	.64	.18	.82	.48	.18	.66
Processing	2.04	1.51	3.55	1.45	1.51	2.96	1.02	1.51	2.53	.68	1.51	2.19	.51	1.51	2.02
Shipping	.85	.27	1.12	.61	.27	.88	.43	.27	.70	.28	.27	.55	.22	.27	.49
Total:	4.81	1.96	6.77	3.43	1.96	5.39	2.41	1.96	4.37	1.60	1.96	3.56	1.21	1.96	3.17
Group II:															
Receiving	.74	.52	1.26	.53	.52	1.05	.37	.52	.89	.25	.52	.77	.18	.52	.70
Processing	1.37	2.02	3.39	.98	2.02	3.00	.69	2.02	2.71	.46	2.02	2.48	.34	2.02	2.36
Shipping	.72	.48	1.20	.51	.48	.99	.36	.48	.84	.24	.48	.72	.18	.48	.66
Total:	2.83	3.02	5.85	2.02	3.02	5.04	1.42	3.02	4.44	.95	3.02	3.97	.70	3.02	3.72
(b) Investment costs estimated for the cost of buildings constructed and equipped in 1952.															
Group I:															
Receiving	2.40	.18	2.58	1.72	.18	1.90	1.20	.18	1.38	.80	.18	.98	.60	.18	.78
Processing	3.16	1.51	4.67	2.26	1.51	3.77	1.58	1.51	3.09	1.05	1.51	2.56	.79	1.51	2.30
Shipping	1.08	.27	1.35	.77	.27	1.04	.54	.27	.81	.36	.27	.63	.27	.27	.54
Total:	6.64	1.96	8.60	4.75	1.96	6.68	3.32	1.96	5.25	2.21	1.96	4.17	1.66	1.96	3.62
Group II:															
Receiving	.82	.52	1.34	.58	.52	1.10	.41	.52	.93	.27	.52	.79	.20	.52	.72
Processing	1.56	2.02	3.58	1.12	2.02	3.14	.78	2.02	2.80	.52	2.02	2.54	.39	2.02	2.41
Shipping	.81	.48	1.29	.58	.48	1.06	.40	.48	.88	.27	.48	.75	.20	.48	.68
Total:	3.19	3.02	6.21	2.28	3.02	5.30	1.59	3.02	4.61	1.06	3.02	4.08	.79	3.02	3.81

[1] For definition of investment costs see footnote 4 page 13

[2] Approximate average number of hours actually operated by the plants in group II.

[3] Approximate average number of hours actually operated by the plants in Group I.

[4] The labor costs shown here are based on the following assumptions: (1) The plants in each group cleaned a weighted average quantity of 2,000 pounds of seed per hour. (2) All the labor costs were variable and labor was paid 75 cents per hour. (3) One half of the seed received was transferred directly to the machine and one half was placed in storage and later transferred to the machine. For Group I all the storage was bulk storage with the average receiving time being 14.6 man minutes per hour of machines operating time. For Group II all the storage was bagged storage with the average receiving time being 41.4 man minutes per hour of machine operating time. (4) Processing time was 121 and 162 man minutes per hour of machine operating time for Group I and II, respectively. (5) Shipping time was 21.5 and 38.5 man minutes per hour of machines operating time for Group I and II, respectively.

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FARM ORGANIZATION AND OPERATION OF
NEGRO OWNER-OPERATOR FARMS
IN NORTHEAST MISSISSIPPI

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

IN COOPERATION WITH ALCORN AGRICULTURAL AND MECHANICAL COLLEGE

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FARM ORGANIZATION AND OPERATION OF NEGRO OWNER-OPERATED FARMS IN NORTHEAST MISSISSIPPI

By ROBERT D. BELL

INTRODUCTION

Nature and Purpose of Study

The principal purpose of the study on which this report is based was to obtain basic information pertaining to farming in Northeast Mississippi from the standpoint of the Negro farmer. Many phases of the organization and operation of Negro owner-operated farms have been studied. Special attention has been given to describing the sizes of farms, combinations of farm enterprises, and production methods which generally resulted in favorable earnings. Information concerning the organization of the various farming systems and soil areas in this section of the State is presented. The study attempts to correlate the major causal factors influencing the wide variations in earnings and points out the extent to which differences in farm organization and methods of management are within the control of the individual farmer. The results of such a study should be particularly helpful to farmers in this area who are seeking to increase their earnings, as well as to the agriculturist advocating the adoption of better farming techniques.

Collection and Preparation of Data

The basic data used in this study were obtained by skilled enumerators through interviews with farmers. The records obtained included estimates made by these farmers in answer to a list of questions. Answers were recorded as given on uniform schedules. Information collected during each day was checked at the end of that day for possible inaccuracies and omissions. Whenever a schedule was found to be incomplete, an attempt was made to get the needed information during the following day.

The field survey was made during the spring and summer of 1952, and the farm year about which information was gathered was the period March 1, 1951 to February 29, 1952. The schedules were designed to record definite data from each farmer covering the financial organization, expenses and returns, physical organization and production, and basic management practices followed in the farm business. Information on milk and cream sales was obtained from the files of milk processing plants serving farmers of the area.

The selection of individual farms to be studied was made from information furnished by the local Production and Marketing Administration (now Agricultural Stabilization and Conservation Service) office. Information contained in their files plus the help of their staff made it possible to develop a fairly accurate list of Negro farmers who owned farms. This information provided the name of the farmer, acreage owned, and a number that designated the farm's location. Locating the farms within the sample area was done by means of a county road map that was also prepared from information supplied by the PMA office. This map had the county divided into small areas, each of which was designated by a number that corresponded with the number assigned to all farmers located within the respective area. Such a map proved to be very helpful throughout the survey because it made it possible for the enumerators to go into the various localities and inquire about the farmers by name.

Names of farmers on the list were stratified according to size of farm, and a random sample of farmers was selected for interview in each stratum, somewhat proportional to the total number in that size group. It was originally hoped that the sample would include about one-half of the Negro owners in the sample area, but this plan had to be altered as many farmers were found to be ineligible when contacted. Among those so excluded were farms operated in family partnership and those with only the farmstead plus one or two additional acres owned by the farmers with all of the cropland rented in. Also, excluded were absentee owners and resident owners who were not operating their farms.

Records of 136 farms were obtained for use in this study, representing 32 percent of the total number of Negro full- and part-owners in the sample area reported by 1950 Census of Agriculture. Of the total number meeting the eligibility criteria, the field sample represented about a 50 percent coverage. Records of some farms taken, however, had to be eliminated from the final sample due to incompleteness of the information. Some of these records were deleted before leaving the area because answers to one or more important items could not be obtained. Others were withdrawn from use because milk records could not be determined with certainty at the processing plants. One record was deleted from the final analysis because the organization and operation of this farm was so greatly different from any other Negro farm in the area. After the data had been collected, a final check was made of the schedules and a few more were eliminated.

Farm analysis forms were developed for the study, and the basic data were transferred from each schedule to one of these printed forms. Space was provided on these forms for the computation of the farm organization and operation factors normally associated with earnings. The data were then coded on IBM tabulation sheets for processing. The coded data were punched on eight IBM cards and machine tabulated.

AREA AND ITS RESOURCES

Northeast Mississippi, as delineated for the purpose of this study, comprised an area of approximately 4.1 million acres, of which approximately 3.3 million acres (or 80 percent) were in farms. The region included 14 percent of Mississippi's land area and an equal portion of its population. The 13 counties representing this region are shown in Figure 1. Clay County, located in the southern part of the region, was the only county that was representative of all of Northeast Mississippi in general soil characteristics. This county was also considered to be reasonably typical of much of the farming areas of the 12 other northeastern counties in general farming conditions. Hence, Clay County is the location of the intensive study on which this report is based.

The location of farms within this county from which the farm records used in this study were obtained is shown in Figure 2. These farms were widely scattered over the sample area so as to represent the Northeast Prairie, Northeast Highland and Flatwoods general soil areas. A limited number of records were obtained in the Pontotoc Ridge area. In Clay County, only a few Negro owner-operated farms were found in the Pontotoc Ridge area, and most of these were located on or near the border of the soil area adjacent to the Flatwoods. For purpose of analysis, the few records obtained in the Pontotoc

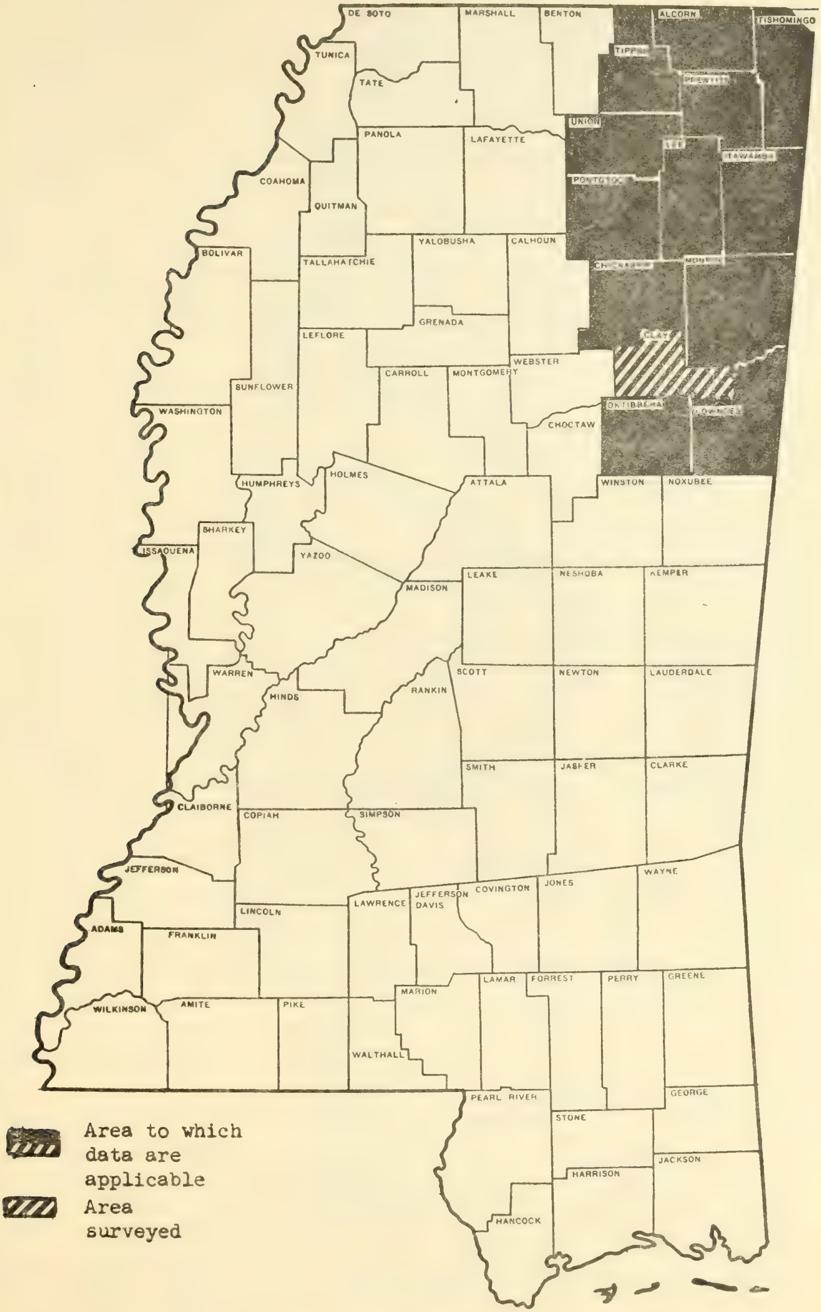
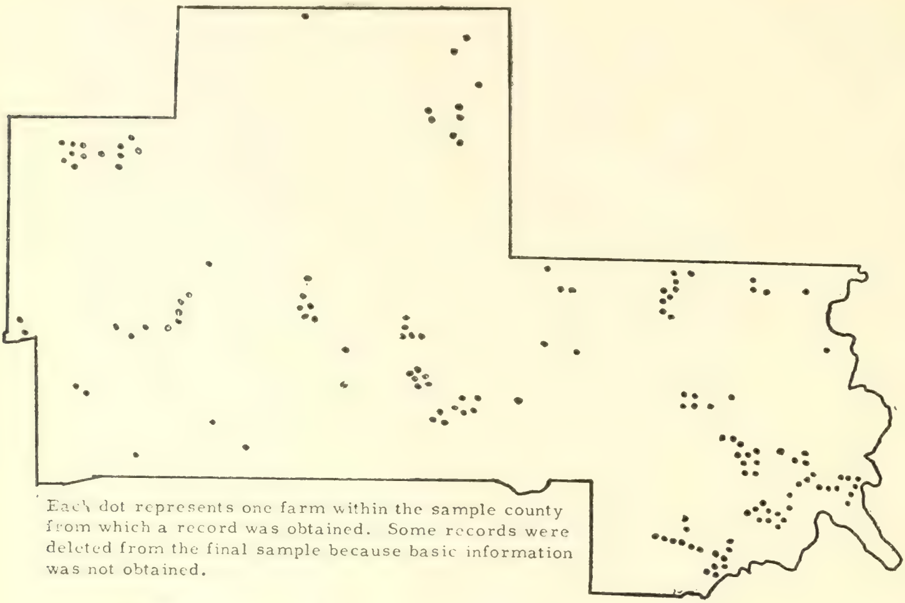

DE SOTO
MARSHALL
BENTON
ALCORN
TISHOMINGO
TIPP
TUNICA
TATE
UNION
PANOLA
LAFAYETTE
LEE
ITAWAMBA
PONTOTOC
COAHOMA
QUITMAN
YALOBUSHA
CALHOUN
BOLIVAR
TALLAHATCHIE
GRENADA
LEFLORE
CLAY
WEBSTER
CARROLL
MONTGOMERY
SUNFLOWER
WASHINGTON
OKTIBBEHA
CHOCTAW
HOLMES
HUMPHREYS
ATTALA
WINSTON
NOXUBEE
SHARKEY
ISSAQUENA
YAZOO
LEAKE
NESHOBA
KEMPER
MADISON
SCOTT
NEWTON
LAUDERDALE
WARREN
RANKIN
HINDS
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
WAYNE
JONES
COVINGTON
JEFFERSON DAVIS
LAWRENCE
LINCOLN
ADAMS
FRANKLIN
GREENE
LAMAR
FORREST
PERRY
MARION
WILKINSON
AMITE
PIKE
WALTHALL
GEORGE
PEARL RIVER
STONE
JACKSON
HARRISON
HANCOCK
Area to which data are applicable
Area surveyed

Figure 1. Delineation of Northeast Mississippi Area.



Each dot represents one farm within the sample county from which a record was obtained. Some records were deleted from the final sample because basic information was not obtained.

Figure 2. Location of farms surveyed within sample area (Clay County).

Ridge were combined with those obtained in the Flatwoods.

Soil and Topography

There is considerable variation in the character of soils and topography in Northeast Mississippi. The soils range in texture from sands to heavy Houston clays, and the topography from the relatively flat prairie lands to the extreme hills of Tishomingo County. Based on similarity in derivation, color, texture, ground cover, and other distinguishing characteristics, Northeast Mississippi is divided into four general soil areas: (1) Northeast Prairie, (2) Northeast Highlands, (3) Pontotoc Ridge, and (4) Flatwoods.[1] The geographic location of these areas is shown in Figure 3. Within each of these soil areas are found numerous kinds of soils, and because the soil areas do not follow county lines, most counties contain parts of two or three different soil areas. Clay county has all four of the soil belts passing through its border, and is thus the one county in Northeast Mississippi in which all of these soils are represented. Owing to the different soil-forming materials, this section of the state has four groups of soils that differ widely between adjoining counties and even between neighboring farms within the same county in adaptation, productivity, and methods of management. A review of the limiting characteristics of the soil resources of the area under study is essential before attempting a study of its farming possibilities.

Northeast Prairie. This soil area, colloquially referred to as the "Black Belt," or "Black Prairie," extends from central Alabama through 12 counties in Northeast Mississippi to the Tennessee border. It enters the state in Kemper County and extends northward in a belt five to thirty miles wide, crossing Noxubee, Lowndes, Oktibbeha, Monroe, Clay,

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[1] From "Soil Map of Mississippi" published by State Department of Agriculture, 1942.

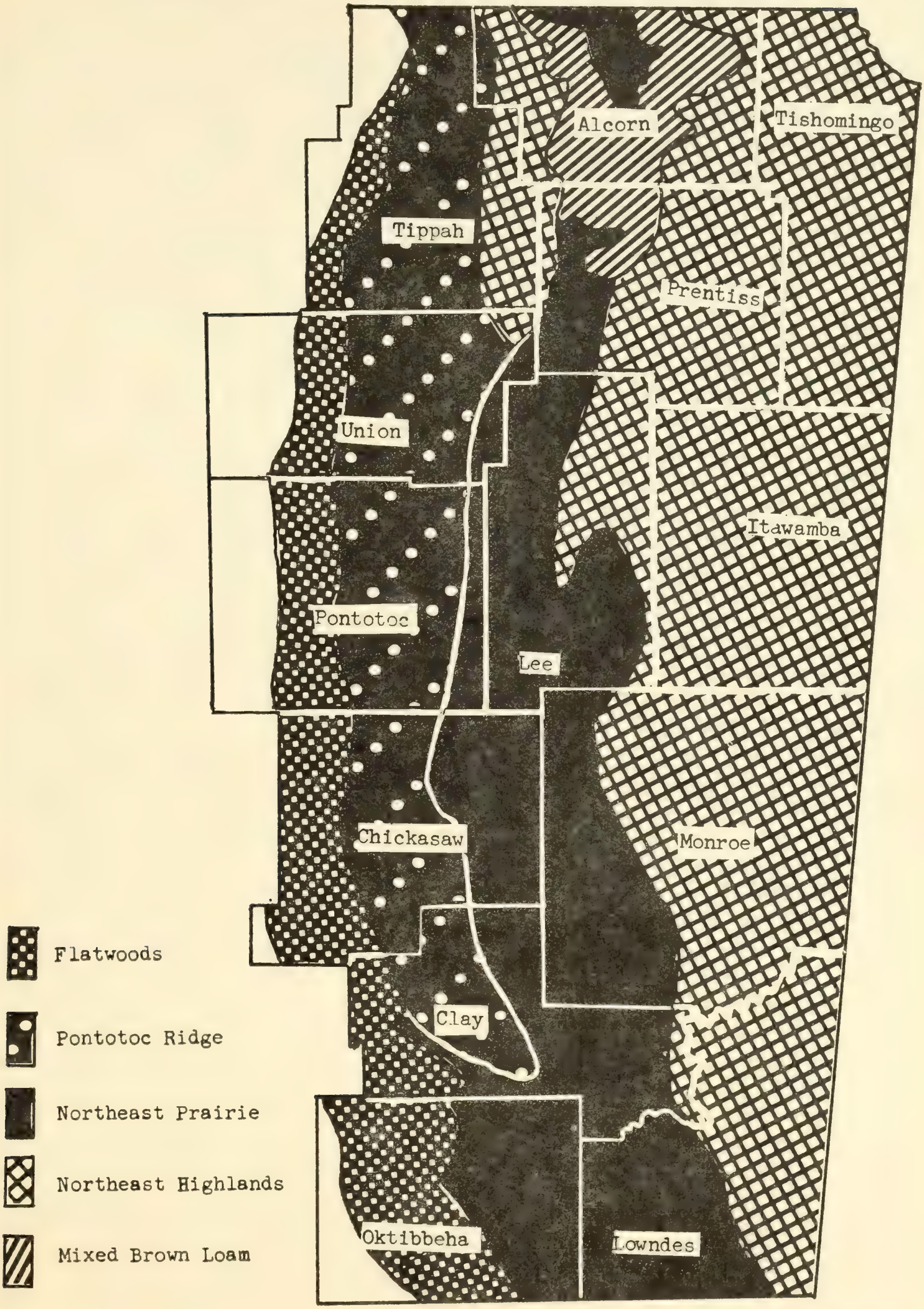
Alcorn
Tishomingo
Tippah
Prentiss
Union
Itawamba
Pontotoc
Lee
Chickasaw
Monroe
Clay
Oktibbeha
Lowndes
Flatwoods
Pontotoc Ridge
Northeast Prairie
Northeast Highlands
Mixed Brown Loam

Figure 3. General soil areas in Northeast Mississippi, as reproduced from "Soil Map of Mississippi" published by State Department of Agriculture, 1942.

Chickasaw, Lee, Pontotoc, Union, Prentiss and Alcorn Counties. None of the counties are entirely within the Prairie Soil area, although seven of these counties (Monroe, Clay, Chickasaw, Lee, Oktibbeha, Lowndes and Noxubee) have a large portion of their land that is prairie soil and are usually considered as comprising the Northeast Prairie Area proper, especially if delineation is made on a county basis.

Practically all of the soils have clay surface soils and extremely heavy clay subsoils which are very sticky when wet, but because of the high lime content are hard and granular when dry. The soils are developed from white, soft, chalky limestone which underlies the entire area at various depths. A large portion of this limestone is obscured by terrace deposits and stream alluvium. Overlaying a considerable portion of the chalky limestone is a shallow bed of unstratified clay. Scattered throughout the area, bald-spots crop out where sheet erosion has worn the top soil thin and hence large areas of limestone are exposed. The soils are recognizable by their dark and red color and also by the native trees and grasses that grow freely. The dark soils are chiefly Houston, Sumpter, and Hunt. The dark grayish to black color of the soil is due to accumulated organic material developed from decayed prairie grasses prior to cultivation. The red soils, commonly referred to as "Post Oak Prairie" or "Red Prairie," are Oktibbeha and Vaiden, and are usually located on the rolling lands where tree growth occurs. Terrace soils of the area are not very extensive and the only prairie soils found are of the Bell Series. Along the stream bottoms the soils resemble the upland soils from which they are derived and range from light sandy loam of the Cahaba series to heavy, dark Trinity clay. Mixed soils of the Catalpa, Kaufman, Houlka and Una series are also found.

The topography of the area, exclusive of the terraced areas, is relatively flat or gently rolling. Where broad ridges occur, they do so with intervening broad flat valleys bordered by gentle slopes. In places the land is hilly and is extensively gullied, but most of the area lies favorable for farming. The surface drainage is good, but due to the impervious structure of the subsoil and the variation in the depth of the topsoil, internal drainage is poor. The black soils are droughty under a wide range of conditions. They are quickly affected by either wet or dry weather, because the soil is usually too shallow and lacking in organic matter to absorb sufficient water when there is too much rain or to retain sufficient moisture when the rainfall is light, as was the case during the year under study. It is not commonly believed, and not often practiced, but most of the prairie soils should be terraced to prevent sheet and gully erosion.

Flatwoods. This soil area enters Mississippi in the northeast corner of Lauderdale County, extending in a northwesterly direction in a belt that varies from 5 to 15 miles wide, crossing Kemper, Noxubee, Winston, Oktibbeha, Clay, Webster, Chickasaw, Calhoun, Pontotoc, Union, Benton, and Tippah Counties.

The soils common to the Flatwoods area are of several types ranging from fine sandy loam to heavy clay supported by a stiff, impervious subsoil. The main upland soils are Pheba, Lufkin, Wilcox, and Caddo; the terrace soils are Myatt, Prentiss and Stough; the bottom soils are predominately of the Ochlockonee series. Toward the northern end of the belt in Pontotoc, Union, and Tippah Counties, some of the mixed Brown Loam and Coastal Plain terrace soils are found.

Most of the Flatwood soils occur on flat or undulating land, and erosion is not generally a problem. Because of the relatively level topography and the nature of the subsoil, most of the soils of the belt are poorly drained and are more valuable for pasture and forage crops than for intertilled crops. These soils are not naturally fertile, but will give good response to treatments of lime and a complete fertilizer.

Pontotoc Ridge. The Pontotoc Ridge includes a range of rather high hills in a wedge-like shape, with the wide end toward the north, lying between the Flatwoods and the Prairie. Starting on the northern border of Mississippi in Alcorn and Tippah Counties with a width of about 20 miles, it extends southward gradually narrowing as it crosses Tippah, Alcorn, Prentiss, Union, Pontotoc, and Chickasaw Counties, and coming to a wedge point in Clay County. The eastern margin forms broad scalloped hills adjacent to the Prairie. Though not readily noticeable in the southern part of the belt, the change from prairie to the Pontotoc Ridge is rather abrupt in the hilly area of the north.

The soil-forming materials of this belt are a mixture of sands, sand-stones, and clays of marine deposits and are reddish in color. Texture of the soils ranges from a sandy loam to clay. Soils of the Ruston series predominate. Other soils common to this area are Greenville and Orangeburg on uplands, and Hannahatchie and Ochlockonee on lowlands.

Topography is rolling to rough and rugged. The hills rise gently about 50 to 60 feet above the valleys on the western side of the belt but are steeper on the east where the valleys are narrower. Because of steeply rolling slopes, the soils have suffered severe damage from accelerated erosion where protective measures have not been applied. In many parts of the area, erosion has formed deep gullies, mostly in the red, sandy soils, resulting in lands of poor agricultural value. Both surface and internal drainage are good. Terracing is very important, though it is often neglected.

Northeast Highlands. This area is a belt one to 15 miles wide and is made up of Upper Coastal Plain soils. The area extends northward from the northeast corner of Noxubee County where it enters the State, and crosses the eastern parts of Lowndes, Clay, Monroe, Lee, Prentiss and Alcorn Counties, and all of Tishomingo and Itawamba Counties.

The soils of this area vary in character from fine tan or reddish-brown sandy loam to clay loams, all formed by marine deposits. The uplands are pebbly red sandy loams. Terrace sands and gravels cover part of the area adjacent to the Tombigbee and Tennessee Rivers, and widely scattered alluvium covers the bottom lands. The most extensive soils of the area belong to the Ruston series, but Savannah, Paden, Ochlockonee, and Cuthbert soils occur throughout the entire area. The range is from the most poorly drained Bibb silt loam soils located on the wet side of the bottom lands to the excessively drained Guin fine sandy loam on the most rugged slopes. The land surface varies from nearly level in the southern part of the area to extremely hilly lands in the northeastern part. In Tishomingo County the elevation above sea level rises as high as 806 feet to form the highest point in Mississippi. Soil erosion is a major problem in the area because of the erosive nature of the soil, the poor soil management practices on many farms, the rugged topography, and the high proportion of intertilled crops.

Influence of Soils on Crop Production.

The main crops grown in Northeast Mississippi are cotton and corn for row crops, and Johnson grass, lespedeza, cowpeas, and soybeans for hay. Much livestock is found on farms in this area. Originally this area, especially the Prairie, was one of the most productive parts of the State, but continued crop-

Table 1. Normal precipitation, Northeast Mississippi.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual	April to August inclusive
Corinth	4.96	4.19	5.60	4.86	4.63	3.78	4.29	4.08	3.31	3.42	3.82	5.57	52.51	21.64
Okolona	4.39	4.54	5.31	4.63	4.20	3.74	4.69	3.90	2.31	2.39	3.32	5.17	48.59	21.16
West Point	4.22	4.20	5.60	3.72	4.56	2.52	3.90	3.02	3.16	3.27	4.36	4.80	47.33	17.72
Fulton	4.75	4.60	5.93	5.06	4.90	3.87	4.70	3.63	2.81	2.99	3.73	5.48	52.45	22.16
Tupelo	4.62	4.45	6.14	4.41	4.71	3.77	4.24	3.70	3.15	2.82	3.92	5.46	51.49	20.93
Columbus	4.74	4.78	6.01	4.74	4.59	3.94	4.38	4.00	2.74	3.04	3.79	5.17	51.75	21.48
Aberdeen	4.60	4.83	5.83	5.00	4.42	4.09	4.75	3.98	2.53	2.95	3.59	5.16	51.58	22.09
State College	4.81	4.58	6.30	4.93	4.50	4.00	4.34	3.67	2.56	2.82	3.49	5.16	51.25	21.53
Pontotoc	4.68	3.92	5.24	4.51	3.96	4.02	4.31	3.34	2.78	2.52	3.31	5.09	47.66	20.12
Booneville	5.14	4.38	5.76	4.89	4.63	3.71	4.10	3.61	2.95	3.23	3.93	5.90	52.54	21.26
Ripley	4.78	5.38	6.72	4.96	5.67	3.74	4.41	3.69	4.16	3.01	3.70	6.49	56.68	22.44
Houston	4.39	4.54	5.31	4.63	4.20	3.74	4.69	3.90	2.31	2.39	3.32	5.17	48.59	21.16

Source: United States Department of Commerce, Weather Bureau.

Table 2. Normal temperatures, Northeast Mississippi.

Station	Degrees Fahrenheit												Annual average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Aberdeen	44.8	46.8	55.3	63.1	71.0	78.8	81.2	80.6	75.4	63.6	52.6	45.6	63.2
Booneville	42.4	44.7	52.9	60.7	69.2	77.5	79.0	79.3	74.6	63.2	51.9	44.0	61.7
Columbus	45.8	47.7	55.6	63.6	71.8	80.0	81.4	81.8	77.1	64.9	53.9	47.0	64.3
Corinth	42.0	43.7	52.8	61.1	69.5	77.2	80.2	79.6	74.3	62.5	51.2	43.6	61.5
Pontotoc	43.7	44.8	54.4	62.1	69.6	77.2	79.6	79.4	74.8	63.4	52.6	44.9	62.2
State College	54.8	48.0	56.0	62.4	71.5	79.0	81.5	80.9	76.2	65.5	54.3	47.2	64.0
Tupelo	43.6	46.0	53.9	62.2	70.2	78.2	80.7	80.4	75.3	63.8	52.0	44.9	62.6
West Point	47.2	49.9	55.7	63.2	71.2	78.0	81.4	80.9	75.7	64.2	52.8	46.4	63.9

Source: United States Department of Commerce, Weather Bureau, Climatological Data for Mississippi.

ping with cotton and corn, together with neglected soil-conservation practices and the advent of the boll weevil since 1914, has greatly depleted soil productivity. The heavy soils of the Prairie are not well suited for cotton under boll weevil conditions, but are naturally well adapted to the production of forage crops, especially Johnson grass hay. For this reason, large areas of prairie lands are used exclusively for pasture and Johnson grass hay. In the northern part of the Northeast Highlands, land suitable for farming is relatively limited and sections on the steeper slopes are now so badly eroded that farming is no longer profitable. Such soils are more favorable for pine and mixed-pine-hardwood timber production. The tillable sandy Upper Coastal Plain soil of this belt is adapted to the production of cotton and general farm crops. In general, the soils of all soil areas will respond well to fertilizers and good management. The consensus of opinion expressed in Mississippi Agricultural Experiment Station publications is that the most profitable use of the soils of Northeast Mississippi under present economic conditions is for pasture and the production of forage and other feed crops in connection with livestock raising and dairying.

Climate

In an area as small as the one included in this study, general climatic conditions are fairly uniform. Even so, the weather varies considerably from year to year and among different parts of the area within any given year. Perhaps no other business is so dependent upon and suffers so badly from small variations in climate as farming.

The climate of this area is relatively agreeable, being sub-tropical and humid in character. The most agreeable weather, however, usually occurs about the middle of September to the latter part of November. Cold periods in the winter are generally of short duration but are acutely felt when they do occur. Snow is rare and seldom remains on the ground. High humidity is prevalent, and this, together with hot nights from early May to about the middle of September, produces discomfort at times during the summer months, relieved by occasional thunderstorms that are sometimes accompanied by local destructive winds. From the middle of March to late in June, there is some danger of tornados occurring in this region as they generally follow a narrow path across the State from southwest to northeast. The effects of the accompanying violent winds from hurricanes occasionally occurring on the Gulf Coast are seldom felt as far inland as Northeast Mississippi.

Annual Precipitation. The normal monthly rainfall for each weather reporting station located in Northeast Mississippi is shown in Table 1. This area, because of its location in the northeastern part of the State, comes within the area of minimum precipitation for Mississippi. Based on a period from 1899 to date, the normal annual amount of rainfall for the State ranges from 64 inches in parts of the Gulf Coast area to less than 50 inches in the north and northeast parts. Within the area under study, there is considerable variation among counties. The highest normal annual rainfall is 56.68 inches at Ripley in Tippah County; the least normal yearly rainfall is 47.33 inches at West Point in Clay County and 47.66 inches at Pontotoc in Pontotoc County. The area as a whole has a normal annual rainfall of about 51 inches. More rain ordinarily falls during winter and spring than during the autumn and summer months. The autumns are usually dry and there are frequent late summer droughts. This relative dryness in autumn and late summer favors the harvesting of cotton and corn crops and curing of large quantities of high-quality hay.

The average yearly rainfall is ample

for abundant crop production when properly distributed throughout the growing season—April to August, inclusive. Rainfall during the five months when it has the most effect on crop production is normally in excess of 40 percent of the yearly total, or about 21 inches. The range of normal variation among counties is between slightly more than 17 to about 22 inches. This results in considerable variation in crop yields among the 13 counties included in this study. In 1951, the crop year under study, the rainfall during the growing season was well below normal, although the annual total was among the seven wettest years on record. This deficiency in rainfall, coupled with high summer temperatures, greatly reduced crop yields that year.

Temperature and Growing Season. Unlike rainfall, temperature did not vary significantly among the different weather-reporting stations in the region, Table 2. This comparative uniformity throughout the area in temperature makes it a constant factor affecting all farms about the same instead of obscuring the results of a management study as does rainfall which varies among neighboring farms and often on different parts of the same farm. The area lacks severe climatic extremes, having mild winters and avoiding the period of intense heat in summers. Such mildness of winter eliminates the necessity of expensive housing for livestock as well as for humans. Nine months of sunshine, either clear or partly cloudy days, means a longer growing season and pasturage.

The average length of the growing season, the period between the dates of the last killing frost in the spring and the first in the fall, varies from 196 days in Tippah County to 226 days in both Clay and Oktibbeha Counties, Table 3. The average for the entire area is 217 days, or about 60 percent of the year, free from killing frosts. The last killing frost in the spring varies on the average from the last five days in March to as late as April 10 in Tippah County. The first in the fall occurs, on the average, during the first five or six days in November, but in the extreme north in Tippah County it is normally as early as October 24. From the standpoint of the length of the growing season all of this area is well adapted to the production of cotton, corn, and other general farm crops.

Population

Northeast Mississippi is predominately a rural area. The 1950 population, as reported by the Census, was 311,416, of which the rural population (farm and nonfarm) numbered 242,138 persons, or 78 percent of the total, Table 4. The total population of 5 counties, Chickasaw, Itawamba, Pontotoc, Tippah and Tishomingo, was classified as rural, and the proportion considered rural in all other counties of the area ranged from 55 percent in Lowndes County to 83 percent in Prentiss. Rural-farm population was reported as 56 percent of the area's population. Of the population living in rural territory in the area, 26,256 persons or 11 percent, were living in the 40 incorporated towns and villages of fewer than 2,500 inhabitants.

The urban population in 1950 comprised 69,278, or 22 percent of the total population of the area. This population was living in the 9 cities and towns of 2,500 or more inhabitants. Two-fifths of the urban population were living in Columbus and Tupelo, the only cities of more than 10,000 inhabitants within the region. Industrial activity has increased in these and other cities of the area, especially in trade and service industries.

The population of the region has not changed rapidly in recent years, except in counties where the larger cities are located, Table 5. From 1930 to 1950,

Table 3. Average dates of first and last killing frosts and length of growing season, Northeast Mississippi.

Stations	County	Dates of killing frosts		Length of growing season in days
		Latest[1]	Earliest[2]	
Aberdeen	Monroe	March 26	October 31	219
Columbus	Lowndes	March 25	November 2	222
Houston	Chickasaw	March 29	November 1	217
State College	Oktibbeha	March 25	November 6	226
Tupelo	Lee	March 30	November 1	216
West Point Exp. Sta.	Clay	March 24	November 5	226
Pontotoc	Pontotoc	March 29	October 30	215
Ripley	Tippah	April 10	October 24	196
Booneville	Prentiss	March 29	November 2	218
Corinth	Alcorn	March 28	October 31	217
Northeast Area		March 28	November 1	217

Source: United States Department of Commerce, Weather Bureau, Mississippi Stations, Climatological Data.

[1] Spring.

[2] Fall.

Table 4. Population in groups of places according to size and color, Northeast Mississippi, 1950.

Type of area and color of population	Number of places	Population	Percent of total population	Percent of total
Northeast Mississippi	----	311,416	100.0	-------
Size of place				
10,000 or more	2	28,699	9.2	41.4
5,000-9,999	4	28,614	9.2	41.3
2,500-4,999	3	11,965	3.8	17.3
Urban, total	9	69,278	22.0	100.0
Place under 2,500	40	26,256	8.4	10.8
2,000-2,499	2	4,550	1.5	1.9
1,500-1,999	4	6,354	2.0	2.6
1,000-1,499	2	2,547	0.8	1.0
999 and under	32	12,805	4.1	5.2
Rural, total	----	242,138	77.8	100.0
Other rural territory	----	215,882	69.3	89.2
Color of population:				
White	----	219,533	70.5	-------
Non-white	----	91,882	29.5	-------

Source: **United States Census of Population:** 1950, U. S. Bureau of Census, Vol. 1, Number of Inhabitants, Chapter 24, Mississippi.

significant increases occurred in the population of Lowndes, Lee, Oktibbeha, and Alcorn Counties, reflecting largely the growth in the cities of Columbus, Tupelo, Starkville, and Corinth. In Lowndes and Oktibbeha Counties, the increase in the number of inhabitants has been the result of increases in both the white and Negro population. In the other counties, it represents a large enough increase in the white population to outweigh the migration of Negroes to other areas. For Northeast Mississippi as a whole, the 9 percent increase in the white inhabitants during the 20-year period was sufficient to offset the 6 percent loss in Negro inhabitants, so that total population increased by 4 percent. This is to be compared with an increase of 9 percent for the State during the same period. There has been only a slight decline in the relative importance of Negro people in the total population. The decrease was from 33 percent in 1930 to 30 percent percent in 1950.

Agricultural and Industrial Development

Agriculture is the principal industry. In 1950, there were more than 100 thousand persons gainfully employed in Northeast Mississippi, consisting of about 30 thousand Negroes and 74 thousand white workers, Table 6. Of this working force, 46 percent was engaged in agriculture. The principal non-agricultural industries in the area are manufacturing, wholesale and retail trade, and the personal and professional services. When combined, these industries accounted for 39 percent of the people employed in 1950. A number of persons in each county were employed in such industries as construction, transportation, communication, public utilities and sanitary services, and amusement, but the relative importance of these individual industries as sources of employment was small.

There was considerable variation among races in the relative importance of certain industries as sources of employment in the area. A larger portion of Negro workers derived their income from agriculture than white workers. Whereas 43 percent of the white persons employed in 1950 was engaged in agriculture, 55 percent of the Negro working force was employed in this industry. Personal service work, mostly in private households, hotels and other lodging places, and in laundering and cleaning establishments accounted for 18 percent of the employment of Negro workers and only 2 percent of the employment of white workers. A significantly larger portion of white than Negro workers were employed in such industries as manufacturing, merchandising (wholesale and retail), some of the professional services, and construction. Work in manufacturing constituted 15 percent of the employment in the white working force in 1950 but only 8 percent of the Negro workers. About 15 percent of the white workers and only 7 percent of the Negro workers were engaged in the merchandising business. In the construction industry and many of the professional services, the differential between races was not very large, but proportionally fewer Negroes were obtaining their livelihoods from these industries.

Marketing and Processing Facilities

Marketing facilities in Northeast Mississippi are available for handling the crops and livestock that form the present farming pattern. Because there are only two cities with a population as great as 10,000 persons, the market opportunities for farm products are rather uniform throughout the area.

Gins for the handling of cotton are scattered over the area in such a manner that they are accessible to all farmers and have ample capacity for handling the cotton crop. In the past decade, most gins have been equipped with modern installations for drying, cleaning and ginning cotton. Some are equipped with compresses. In addition to gins, there are sufficient warehouses and several cotton oil mills operating in the area.

The area is well served by milk receiving and processing plants. In the early forties, there were 9 cheese plants, 3 condenseries, 4 creameries, 2 milk-cooling stations for Grade A milk, and 21 cream-buying stations operating in the area.[2] Since that time, the number of such facilities has increased due to the tremendous momentum that dairying has gained in recent years. Some old milk or cream routes were extended and new ones have been started to reach

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[2] D. W. Parvin, "Development of the Dairy Industry in Mississippi," Agricultural Experiment Station Bulletin 422, 1945.

Table 5. Population trends, by race, for counties in Northeast Mississippi, 1930 and 1950.

	Negro			White		
County	1930	1950	Percentage change 1930-1950	1930	1950	Percentage change 1930-1950
Monroe	16,055	13,714	—14.6	20,086	22,829	13.6
Lowndes	17,318	18,410	6.3	12,669	19,442	15.3
Chickasaw	10,461	8,426	—19.5	10,374	10,525	1.4
Oktibbeha	11,367	11,751	3.4	7,752	12,818	65.4
Lee	11,227	10,659	—5.1	24,086	27,578	14.5
Clay	11,081	10,097	—8.9	6,850	7,660	11.8
Pontotoc	4,193	3,816	—9.1	17,841	16,178	—9.3
Tippah	3,151	3,393	7.7	15,507	14,129	—8.9
Union	4,542	3,636	—20.0	16,726	16,626	—0.6
Prentiss	2,473	2,333	—5.7	16,792	17,477	4.1
Alcorn	4,130	3,904	—5.5	19,523	23,254	19.1
Itawamba	1,047	937	—10.5	17,178	16,279	—5.2
Tishomingo	1,028	806	—21.6	15,383	14,738	—4.2
Area	98,073	91,882	—6.3	200,767	219,533	9.3

Source: United States Census of Population: 1930 and 1950.

Table 6. Industry of employed persons, by race, for Northeast Mississippi, 1950.

	All races		Negro		White	
Industry group	Number of persons employed	Percent of total	Number of persons employed	Percent of total	Number of persons employed	Percent of total
Agriculture and forestry	47,956	46.4	16,312	54.8	31,644	43.0
Manufacturing	13,167	12.8	2,255	7.6	10,912	14.8
Construction	4,383	4.2	710	2.4	3,673	5.0
Transportation and commerce[1]	3,967	3.8	905	3.0	3,062	4.1
Wholesale and retail trade	12,930	12.5	1,975	6.6	10,955	14.9
Personal services[2]	7,153	6.9	5,329	17.9	1,824	2.5
Professional and related services[3]	6,795	6.6	1,408	4.7	5,387	7.3
Entertainment and recreation	422	0.4	70	0.2	352	0.5
Others[4]	4,666	4.5	347	1.2	4,292	5.8
Occupation not reported	1,816	1.8	409	1.4	1,407	1.9
Total employed	103,255	100.0	29,747	100.0	73,508	100.0

Source: United States Census of Population: 1950, United States Bureau of Census, Vol. II, Characteristics of the Population, Part 24, Mississippi, Chapter B.

[1] Includes transportation, communication and other public utilities.

[2] Includes private households; hotels and lodging places; laundering, cleaning and dyeing services; shoe repair shops; dressmaking shops; and miscellaneous personal services.

[3] Includes medical and other health services; legal, educational, welfare, and religious services; and miscellaneous professional and related services.

[4] Includes finance, insurance, and real estate; business and repair services; government; and crude petroleum and natural gas extraction.

into almost every community. At present, almost all farmers can have their milk picked up daily by truck at their farms and transported to a processing plant for a normal fee, mostly 30 or 35 cents per 100 pounds.

Livestock auction markets are operating at present in all counties in the area and are the most important single outlets for livestock. A greater portion of cattle is ordinarily marketed through auctions than hogs.[3] Local dealers or truck buyers are operating in each county, and the sale of livestock to other farmers is an important market outlet for many farmers with a few cattle to sell. There is also a large packing plant located in the southern part of the area in Clay County, and local butchers are scattered throughout the area.

More than 600 buyers and processors of forest products are active in the area and these timber-using industries are well developed.[4] Included are more than 500 portable sawmills; a creosoting plant at Columbus that handles poles, pilings, and/or crossties; and at least eight companies buying pine and sweetgum pulpwood within the area for shipment to mills in other parts of Mississippi and in neighboring states. Most of the timber is marketed in the form of lumber, pulpwood, crossties, and cooperage. Much of the marketed products leave the area by rail and trucks, and moves to consumers in Indiana and Illinois or to nearby markets at Memphis and Jackson, Tennessee. Local consumption is limited principally to special products made within the area or to bridge timbers, planking, and construction lumber. Caskets are made at West Point; farm equipment at Houston, Pontotoc, Randolph, Baldwyn, and Booneville; furniture at Columbus, Corinth, Pontotoc, Iuka and Booneville; staves at Columbus and Amory; implement handles at Van Vleet; veneer boards at Columbus; and trailers and bodies are constructed at Corinth, Okolona and Booneville.[5] There are also woodworking shops located at West Point, Ecru, and Pontotoc where numerous small items are manufactured.

Market facilities for other farm products produced in the area have not been greatly developed. Fairly good local markets for poultry and eggs exist in some counties, particularly those with the larger towns.

Transportation Facilities

Railway and highway facilities are well developed in Northeast Mississippi. Several trunk line railroads, the Illinois Central, the Gulf, Mobile and Ohio, and various feeder branches reaching local points, traverse the area. Each county is served by one or more railroads. The system of highways and secondary roads gives farmers access to local markets and shipping points. The area is traversed by a network of federal and state highways. The federal highways include U. S. Highway 45, crossing in a northly-southerly direction; U. S. Highways 72 and 82, crossing the area from east to west; and U. S. Highways 78 and 278, crossing diagonally. Numerous paved and gravelled highways connect the towns with small villages. County-maintained secondary roads, reaching outlying points in the rural areas, are well graded and are easily passable at all times except in periods of unusually heavy rainfall.

Present Agriculture in the Area

System of Farming. Northeast Mississippi is the principal commercial dairy center of the state. Commercial production of beef cattle is also increasing in importance. Hogs and poultry, although not highly important as commercial enterprises, are adding dollars to more farmers' income. The heavy soil of the prairie portions of the area is relatively well adapted to the production of pasture and forage crops. The area also has sufficient creameries and condenseries to provide a ready local market for milk and cream. As a result of these good pastures and local market outlets for dairy products, there are sections of the area where dairying has advantage over cotton growing.[6]

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[3] Parvin, D. W., "Livestock Auctions in Mississippi," Mississippi Agricultural Experiment Station Bulletin 400, 1944.

[4] Judson. G. M., and Switzer, G. L., "Timber Products Marketing in Northeast Mississippi," Mississippi Agricultural Experiment Station Bulletin 494. October 1952.

[5] D. W. Shelton, "Farm Forestry in Mississippi," Mississippi Agricultural Experiment Station Bulletin 432, June 1946.

The distribution of the most numerous systems of farming in each county of the area, as indicated by the 1950 census, is shown graphically in Figure 4. Cotton farms were the most important numerically in all but Oktibbeha County; dairy farms rank second in number in Clay, Lee, Chickasaw, Lowndes, Pontotoc, Union and Prentiss Counties. Dairying, however, was of much greater importance than is indicated by the number of farms classified as dairy farms. Because dairying is an important supplemental source of income on most farms of other systems, several combination systems of farming (such as cotton-dairy or cotton and dairy) were found that were not considered in the census classification. Even on livestock farms (where beef cattle is usually most important) milk sales were fairly large, sometimes approaching nearly 30 percent of the total value of farm products sold.

Cattle raising has become more important in the area in recent years but the percentage of farms on which livestock provided the chief source of income was still small. Cattle raising was most important in Clay, Lowndes, Chickasaw, and Monroe Counties where the acreages suited to pasture and close-growing crops are large on the average farm.

General farms, those on which no individual farm products or group of closely related products account for as much as half of the total value of farm products sold, were numerous in the area. Such farms rank second numerically in five counties and third in seven other counties. Other than a few highly successful diversified farms, general farms tended to be of low productivity and were usually operated by marginal and submarginal farmers who depended on considerable off-farm work to supplement low incomes from the farms.

As already stated, poultry farming in the area was not highly significant as a commercial enterprise. Poultry was instead a sideline enterprise on a large percentage of the farms. According to the 1950 census, 221 farms in the area had poultry and poultry products sales large enough to be classified as poultry farms. The heaviest concentration of the poultry flock in proportion to the acreage of crops was in Lee, Itawamba and Prentiss Counties.

Other systems of farming were so few in number that they were only important in scattered local areas. A few truck farms were located near the larger towns to supply the local demand for vegetables in Monroe, Lee and Alcorn Counties. There were also a few fruit and nut farms in Lowndes, Lee and Itawamba Counties. Commercial production of fruit and nuts in this area has been largely limited to apples, peaches, pecans and pears. Commerical production of apples was most important in Tishimingo, Tippah, Monroe, and Alcorn Counties; pecans in Lowndes, Lee, and Monroe Counties; peaches in Tishimingo, Tippah and Monroe Counties; and pears in Tippah, Prentiss, Alcorn and Lee Counties.

Tenure. Significant changes have been taking place in the tenure pattern of

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[6] See the appendix for an illustration of favorable and unfavorable conditions affecting systems of farming.

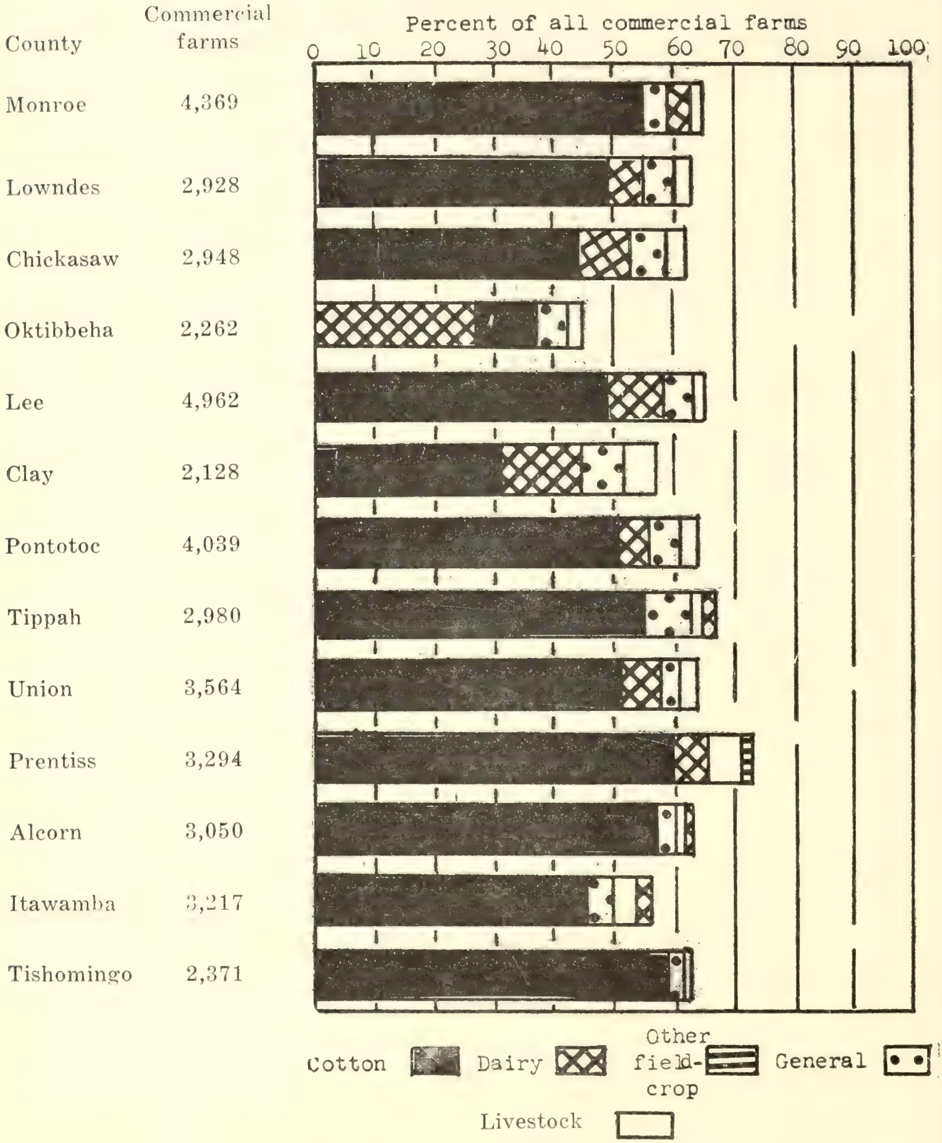

Figure 4. Percentage of all commercial farms represented by the four most important systems of farming in each county, Northeast Mississippi, Census of 1950.

Northeast Mississippi. Since 1930, farm ownership has shown a continuous upward trend, while the number of renter-operated farms has been declining, as shown in Table 7. One-third of the farms in the area in 1930 were either operated by full owners or by part owners. Land purchasing reached its peak in the forties, hence more than one-half of the farms were being operated by owners in 1950. The number of farms operated by full owners increased 40 percent from 1930 to 1950, while the number operated by part owners increased 188 percent from 1940 to 1950, after having decreased 13 percent during the thirties, when many farmers with small holdings lost their farms and were reduced to tenant status.

Tenancy has declined at a faster rate than ownership has increased, as a result of the reduction in the number of farms. The proportion of tenant-operated farms in the area has varied, since tenancy started to decline, from 66 percent in 1930 to 43 percent 1950. In 1920 the percentage was 58. Third-and-fourth share renters, cash renters, share croppers, and all those who rent under other conditions or types of agreements are classed as tenants by the census. In 1950, one-half of all tenants were classed as share renters, 38 percent were share croppers, 6 percent were cash renters, and the remaining 6 percent were leasing under other arrangements.

The proportion of tenant-operated farms among Negro farmers in Northeast Mississippi, although considerably lower than in other upland areas of the State, is higher than for white farmers. In 1950, 67 percent of the Negro farms were operated by tenants, 23 percent by owners, and 9 percent by part owners, Table 8. Within the area the proportion of tenancy varied according to local conditions. Itawamba and Tishomingo, the only counties completely within the Northeast Highland soil area, had the lowest tenancy and also the smallest number of Negro farms. In these two counties from one-half to two-thirds of the farms were operated by owners with only 32 to 46 percent being operated by tenants. Tenancy on Negro farms in other parts of the area was least important in Oktibbeha, a predominately dairy county. In Prentiss County, where the smallest portion of part owners was found, tenancy was 80 percent, the highest in the area.

Table 7. Tenure of farm operators, Northeast Mississippi, 1920-1950.

	Number of farm operators				Percentage of farm operators			
Tenure group	1920	1930	1940	1950	1920	1930	1940	1950
Total operators	42,992	48,861	44,386	42,112	100	100	100	100
Full owners	15,752	14,019	15,623	19,241	37	29	35	46
Part owners	2,188	2,396	2,095	4,573	5	5	5	11
Managers	94	60	50	54	[2]	[2]	[2]	[2]
Tenants:								
Croppers	8,448	14,308	11,133	6,909	20	29	25	16
Cash tenants	3,085	3,511	2,657	1,049	7	7	6	2
Other tenants[1]	13,425	14,567	12,828	10,286	31	30	29	25
Total tenants	24,968	32,386	26,618	18,244	58	66	60	43

Source: United States Census of Agriculture: 1920, 1930, 1940 and 1950.

[1] Includes mostly share tenants but also share-cash and other tenants.

[2] Less than 0.5.

Table 8. Distribution of Negro farm operators by counties and tenure, Northeast Mississippi, 1950.

County or area	Farm operators (number)	Percentage in each tenure group				
		Full owners	Part owners	Total owners	Managers	Tenants
Monroe	1,742	19.8	7.7	27.6	[1]	72.4
Lowndes	1,560	26.7	6.8	33.6		66.4
Chickasaw	1,375	16.2	6.8	23.0	[1]	76.9
Oktibbeha	1,361	37.4	11.9	49.3		50.7
Lee	1,354	12.6	11.8	24.4	[1]	75.6
Clay	1,271	25.8	10.7	36.5		63.5
Pontotoc	672	26.1	10.6	36.7		63.2
Tippah	491	21.6	6.7	28.3		71.7
Union	460	19.8	9.8	29.6		70.4
Prentiss	285	16.2	3.8	20.0		80.0
Alcorn	255	23.1	11.4	34.5		65.5
Itawamba	138	44.2	10.1	54.3		45.7
Tishomingo	98	51.0	17.4	68.4		31.6
Northeast Mississippi	11,062	23.3	9.2	32.5	[1]	67.4
State	123,089	18.9	4.6	23.5	[1]	75.5

Source: United States Census of Agriculture: 1950, U. S. Bureau of Census, Vol. 1, Counties and State Economic Areas, Part 22.

[1] Three Negro farm managers were reported in Northeast Mississippi, one each in Monroe, Chickasaw, and Lee Counties; 36 were reported in the State.

FARM ORGANIZATION, OPERATION, AND EARNINGS

System of Farming and Basis For Classification

The method used in determing the system of farming followed on each farm included in the study was based on the proportion of the cash income derived from the principal farm enterprise or combination of enterprises.[7] In many cases, the farming system could be determined on the basis of the sales from a single enterprise, such as cotton, or on the basis of a specialized product, such as milk or cream. In other cases, the farming system had to be determined on the basis of the sales from a closely related group of farm products, involving cattle, hogs, poultry, sheep, goats, and milk. If the value of the product sold from a given farm enterprise or a closely related group of enterprises amounted to 40 percent or more of the cash receipts, the system of farming was designated by this enterprise, such as a cotton farm or a livestock farm. If a second enterprise or a closely related group of enterprises was an important supplementary source of cash income, the farm was regarded as having a combination system of farming, such as a cotton-dairy farm or a cotton-livestock farm. If the income from two or more unrelated enterprises was required to make up 40 percent or more of the cash receipts, the farm was regarded as a general farm. The following eight systems of farming were recognized:

1. **Cotton farms** were those farms having 40 percent or more of the cash receipts from cotton sales and loan payments received on cotton in government

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[7] The method of classification used for this study is essentially the same as that used in grouping farms according to type-of-farming in another publication of this Experiment Station. Certain changes were made in order to adapt the system more closely to local conditions prevailing in this area among Negro farmers. Reference is therefore made to W. G. O'Leary, "Organization and Operation of Farms in the Black Prairie Area, Mississippi," Mississippi Agricultural Experiment Station Bulletin 404, June 1944, pp.26-27.

storage, provided that less than 20 percent of the cash receipts was received from the sales of dairy products, cattle, hogs, poultry, sheep and goats.

2. **Cotton-livestock farms** were those on which at least 40 percent of the cash receipts was derived from the cotton enterprise (as in 1 above), plus an additional proportion of at least 20 but less than 40 percent from the combined sales of dairy products, cattle, hogs, poultry, sheep and goats, provided that none of these classes of livestock or livestock products represented individually as much as 20 percent of the cash receipts.

3. **Cotton-dairy farms** obtained at least 40 percent of the cash receipts from the cotton enterprise plus at least 20 but less than 40 percent from the sales of milk and cream.

4. **Cotton and livestock farms** were those farms on which 40 percent or more of the cash receipts was derived from the cotton crop, plus an additional 40 percent or more from the combined sales of dairy products, cattle, hogs, poultry, sheep and goats. Farmers operating this system of farming were placing major and about equal emphasis on both livestock and cotton with each being of about equal importance.

5. **Livestock farms** obtained 40 percent or more of the cash receipts from the combined sales of dairy products, cattle, hogs, poultry, sheep and goats, but less than 40 percent from an individual class of livestock or livestock products, and had less than 20 percent from cotton.

6. **Livestock-cotton farms** obtained 40 percent or more of the cash receipts from the combined sales of dairy products, cattle, hogs, poultry, sheep and goats, but less than 40 percent from an individual class of livestock or livestock products, plus an additional proportion of at least 20 but under 40 percent from the cotton crop.

7. **Dairy-cotton farms** obtained 40 percent or more of the cash receipts from the sales of milk and cream plus an additional proportion of at least 20 percent but under 40 percent from cotton.

8. **General farms** were so classed whenever less than 40 percent of the cash receipts was derived from the cotton crop, or the sales of dairy products, cattle, hogs, poultry, sheep and goats.

The farming system involving cotton as the principal source of income predominated among the farms of the area, and the cotton crop was of considerable importance in farming systems emphasizing livestock production, dairying and general farms, Table 9. About one-half of the farmers included in this study depended largely on cotton as their major cash crop. Of these farmers two out of five depended almost entirely on the cotton crop, whereas the others supplemented the cotton crop with a livestock enterprise. Livestock production and dairying were the major cash enterprises on one-fourth of the farms. Although milk was a supplemental source of income on two-thirds of the farms, dairying was not a principal source of cash income except on a few small farms located in the Northeast Highlands and in the Flatwoods. Only 5 percent of the farms in the Northeast Highlands and 2 percent in the Flatwoods were classed as dairy-cotton farms. In the Northeast Highlands, another 12 percent of the farmers depended relatively heavily (second to cotton) on milk sales for a cash income. The general farming system was followed on the remaining one-fourth of the farms.

The proportion of farms classed as being general farms was no doubt higher than normal for the area, due to the weakness of using the source of income for a single year as the basis for determining the system of farming. Cotton yields in the area were somewhat unfavorable during the period of study. Thus, many farms that would have been classed as cotton farms under more favorable cotton yields, were depressed into the general farm class.

Table 9. Percentage distribution of farms by system of farming and soil area, Negro owner-operated farms, Northeast Mississippi. 1951.

System of farming	All farms	Soil areas[1] Northeast Prairie	 Northeast Highlands	 Flatwoods[2]
Cotton	19	24	21	14
Cotton-livestock	16	18	10	14
Cotton and livestock	10	8	10	12
Livestock	12	10	7	18
Livestock-cotton	11	16	10	13
Cotton-dairy	4	3	12	------
Dairy-cotton	2		5	2
General	25	21	26	27
All systems	100	100	100	100

[1] Grouped by the local technicians of the Soil Conservation Service according to the general soil area in which each sample farm was located.

[2] Includes seven farms located on Pontotoc Ridge soil near the border of the soil area adjacent to the Flatwoods.

Size of Farm and Use of Land

Size of Farm. The total area of land operated per farm averaged 102 acres, Figure 5. The farms ranged in size from 17 to 665 acres. Nearly three-fourths of all farms were over 30 but less than 150 acres in size. The most frequent size of unit in the area was approximately 72 acres. In general, the farms in the Flatwoods were much larger than those in either the Northeast Prairie or the Northeast Highlands. The average farm in the Flatwoods consisted of 124 acres, whereas the average sizes in the Prairie and in the Highlands were 90 and 83 acres, respectively.

The different systems of farming varied in the size of farm. That is, certain systems tended to be relatively more numerous on large farms, while others were concentrated in the small or medium sizes. The farming systems involving livestock and livestock products as primary sources of income were found more frequently on the larger farms. The average size of livestock farms consisted of 129 acres, that of livestock-cotton farms was 114 acres, and that of dairy-cotton farms was 112 acres. Where cotton was the major cash enterprise, the farms were, with few exceptions, relatively small in size. The general farms were also relatively small.

Use of Land. About 29 percent of the total land area on farms studied was utilized in the production of crops, Table 10. These farms reported an average of 30 acres on which crops were harvested or temporarily grazed during the year of study. In addition, there wa some cropland on about one-half of the farms normally used for growing crops but was allowed to be idle. Cropland left idle was relatively inferior in most cases. By adding this idle land to the acreage in harvested and temporarily grazed crops, the total land available for crop production in the area amounted to 35 percent of the farm land. Only four-fifths of this cropland, however, was actually being utilized in growing crops

In the Northeast Prairie, the land is of such physical condition that a higher proportion is normally utilized in crop production than is true for the Northeast Highlands and the Flatwoods. More than one-third of the farm land in the Northeast Prairie was used for growing crops compared with less than 30 percent in the Flatwoods and the Northeast Highlands.

Cotton farms, when compared to other

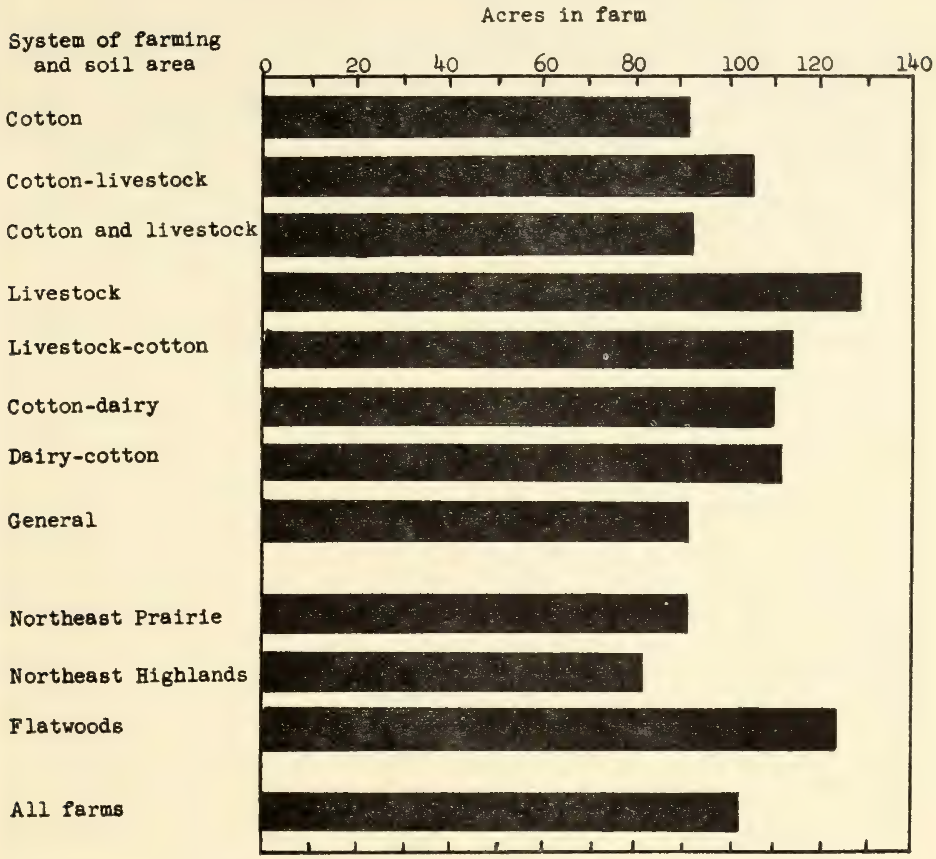

Figure 5. Average size of farms on different farming systems and in different soil areas.

farming systems, had a very high proportion of the land area in crops. Forty percent of the total land for farms having this system was in crops. The acreage used in the production of harvested and temporarily grazed crops plus the cropland allowed to be idle during the year, occupied almost one-half of the total farm land. Other farming systems utilized proportionally less of the farm land for growing crops, and all except the cotton and livestock and the general farms had a smaller percentage of the land lying idle.

A large proportion of the land in the area was in pasture, and was used for dairy and livestock farming. Usually the pastures were found on the sloping red soils which were low in lime, or on lands not very suitable for row crops. Pasture land, irrespective of kind, occupied 54 percent of all farm land. Two-thirds of the pasture on farms was tillable, or, as termed here, open pasture. The farmers were placing little emphasis on improving their pastures.[8] For every 8 acres of open pasture on the farms surveyed an average of only one acre had been clipped, seeded, fertilized, or limed. Open pasture on which no improvements had been applied averaged 32 acres per farm; woodland pasture, or fenced-in timber land, averaged 19 acres per farm. There was a wide difference among farming systems in the importance of pasture land and some difference among the three soil areas. On farms where cotton was the only leading enterprise, only two-fifths (41 percent) of the land was in pasture; but where livestock production and dairying ranked as important sources of cash income, from one-half to two-thirds of the land was utilized for pasture. Open pasture was most important on the dairy-cotton farms where pasture reported averaged 52 acres per farm. Woodland pasture was most important on the cotton-dairy farms. The pastures were generally larger on farms in the Flatwoods and smaller on the farms in the Northeast Prairie. Almost three-fifths, or 59 percent, of the farm land in the Flatwoods was used for pasture. The corresponding proportions of the land in pastures in the Northeast Prairie and Northeast Highlands were 46 and 55 percent respectively.

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[8] See page 92 in the appendix for the principal recommendations of the Mississippi Agricultural Experiment Station concerning pastures in this area.

Nearly all farms included a little woodland that was not fenced in for pasture. Such land accounted for 9 percent of the total farm land, and was twice as large on the average farm in the Flatwoods as on the typical farm in the Northeast Prairie or Northeast Highlands. Livestock-cotton farms fenced in fewer acres of timber land and thus had more of their woodland not in pasture than other farming systems. From two to three acres of the remainder of the farm land were in farmsteads, feed lots, farm roads, and ditches.

Three crops occupied over 90 percent of the land in crops on the farms studied. Cowpeas and soybeans for peas and beans, peanuts, and truck crops, temporary grazing crops, and cover crops were far less important in acreage in Northeast Mississippi than cash and feed crops of cotton, corn and hay. The proportion of the crop area used for the various crops and the percentage of farms on which these crops were grown are shown in Figure 6. In addition, Table 11 presents the average acreage of important crops grown for the different farming systems and the different soil areas.

In this region cotton provides the main source of income on most farms. Under most conditions, it is the crop which yields the greatest returns for the labor

Table 10. Utilization of land per farm, showing the wide difference among farming systems and soil areas, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Percentage of land in: Harvested crops	Open pasture	Woodland pasture	Idle cropland	Woodland waste	Farmstead
All farms	136	29	35	19	6	9	2
System of farming:							
Cotton	26	40	27	14	8	9	2
Cotton-livestock	22	30	31	24	5	8	2
Cotton and livestock	14	28	34	15	10	11	2
Livestock	17	24	39	22	5	8	2
Livestock-cotton	15	30	40	11	3	13	3
Cotton-dairy	5	24	38	29	3	4	2
Dairy-cotton	3	32	46	6	5	10	3
General	34	25	37	20	8	8	2
Major soil area:							
Northeast Prairie	42	36	33	13	8	8	2
Northeast Highlands	38	29	38	17	7	7	2
Flatwoods	56	26	35	24	3	10	2

of the farm family.[9] Cotton was grown on 95 percent of the farms surveyed and on 30 percent of the crop area. These farmers reported an average of 9 acres in cotton, varying from 1 to 125 acres. As a rule, the acreage in cotton per farm was relatively larger on farms utilizing cropper labor, those having a large amount of family labor, or both. The amount of man labor available on a farm influenced the cotton acreage largely because harvesting in the area was done by hand, and picking and hoeing together consumed more labor than all other operations in growing the crop. The largest acreage in cotton was on the farming system where the only important source of income was the cotton crop. On these cotton farms approximately 40 percent of the crop acreage was in this crop. On the farming systems emphasizing cotton as the primary cash enterprise but with livestock ranking second, at least 30 percent of the crop acreage was in cotton. Less emphasis was placed on cotton and more on feed crops on the farms where livestock production and dairying were leading cash enterprises. The acreage in cotton was about equal on the average farms of the Northeast Prairie and the Flatwoods. In the Northeast Highland, however, fewer acres per farm were planted in cotton.

Corn occupied a greater acreage than any other crop in the area. Corn was grown largely as a source of feed for the dairy cows and other livestock and, except for a few farms, was not a cash crop. The corn crop was utilized mostly as grain; but on many farms, corn interplanted with soybeans or cowpeas was cut for corn stover where grain failed to develop. Some corn was grown on all farms, and the crop occupied more than one-third of the crop area. The average acreage in corn per farm did not differ much in the different soil areas of Northeast Mississippi. About 10 to 12 acres per farm were planted in corn, regardless of the soil area. There was some substitution of grain for hay in the Northeast Highlands where hogs represented proportionally more of the productive animal units on farms.

More emphasis was placed on hay production in this area than in other sections of the State, due to the suitability of the prairie soils for Johnson grass and the relative importance of dairying and livestock farming. Hay was an important crop on two-thirds of the farms and occupied one-fourth of the crop area. The hay crop averaged about eight acres per farm. In the area, Johnson grass was generally the leading hay crop, followed (in the order of importance) by lespedeza and soybeans. Of the total hay acreage, 55 percent was in Johnson grass, 19 percent was in lespedeza, and 14 percent was in soybeans. Johnson grass produced 57 percent of the total hay harvested during the period of the study, lespedeza produced 20 percent, and soybeans produced 14 percent. Other hay crops included clover and sorghum, and were of minor significance except in local areas. Because the heavy soils of the Prairie section are naturally well adapted to the production of Johnson grass, a larger acreage per farm was used for this hay crop in this soil area than in the Northeast Highlands or Flatwoods. Soybean hay was stressed more in the Northeast Highlands than in other soil areas; lespedeza received the greatest emphasis in the Flatwoods.

Livestock Organization

Livestock production is of considerable importance on farms in Northeast Mississippi. Dairying was the most important commercial livestock enterprise and

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[9] This statement is based on the findings of another study. For a detailed statement, see D. W. Parvin, "The Nature of an Efficient Agriculture in the Northeast Prairie Area of Mississippi," Mississippi Agricultural Experiment Station Bulletin 459, January 1949, p. 11.

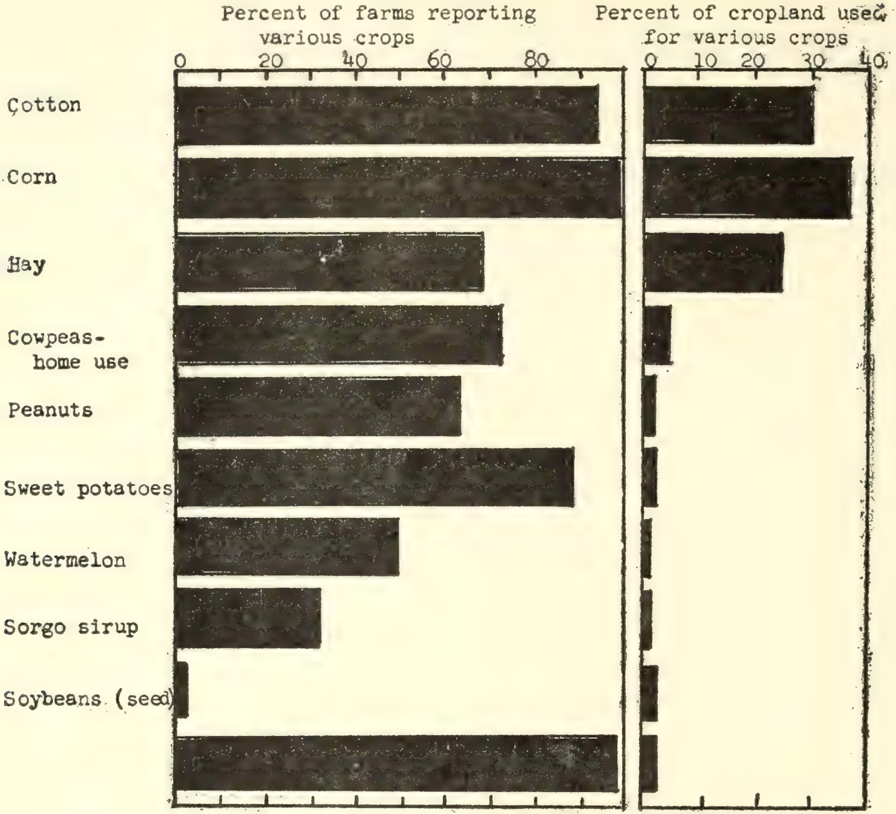

Figure 6. Proportion of tilled cropland used for various crops and percentage of farms reporting these crops.

was exceeded only by cotton as a source of income on most farms. Considerable emphasis has been placed on beef production in this area. The importance of beef cattle on most Negro farms, however, was largely that of supplementing cotton production and dairying. As such, a Negro farm with beef cattle as the major source of income was hard to find. Instead, the cattle enterprises were usually fitted into farming systems involving cotton as the primary source of income and livestock as secondary or into systems where cattle together with dairying and other livestock enterprises accounted for the major part of the income with cotton ranking second. The smallness of the majority of the farms, the severe competition with dairying, the limited credit and capital on most farms, and a lack of technical knowledge of livestock management were factors hindering the entrance of the Negro farmers of this area into beef cattle production on a broader scale.

The amount and kind of livestock maintained on farms included in this study are indicated in Table 12, in which the farms have been grouped on the basis of system of farming and soil area. The average numbers of livestock kept on farms during the period under study were 7 dairy cows, 4 young cattle, 3 horses and/or mules, 1 brood s and chickens. There were few purebred dairy cows and beef cattle found on Negro farms, although registered, purebred livestock were quite common in this area. Most milk cows were grade Jerseys of poor quality. A few farmers were using purebred bulls and in this way had bred their dairy cows up to a satisfactory standard. Purebred beef cattle were mostly of the Hereford breed. Much improvment has been made in the quality of hogs raised. Purebred hogs were becoming fairly common. The Poland-China was the breed most frequently found, followed by the Duroc-Jersey.

As expected, the dairy-cotton, livestock and livestock-cotton farms kept more dairy cattle than other farming systems. Of course, the dairy-cotton farms, with an average of 12 cows, kept the largest dairy herds. Smaller dairy herds were generally maintained on farms in the Northeast Highlands than was true of the Northeast Prairie and the Flatwoods. Dairy cows were kept on 98 percent of all farms studies; two-thirds of all farmers sold milk and/or cream. None of these farmers were producing Grade A milk. The important position that dairying holds among Negro farmers in this area is not due to the presence of large-scale dairy farms, but instead the aggregate result of the large number of small herds producing milk for processing purposes. Three-fifths of these herds ranged from 3 to 10 cows. Only 5 percent of all farms kept as many as 15 cows.

Beef cattle production was limited mostly to the livestock and the livestock-cotton farming systems, although a few herds of beef cows were kept on a few widely scattered cotton and livestock and general farms. More emphasis was placed on cattle raising in the Flatwoods where larger farms prevailed than in the other soil areas. Beef cows were reported on 1 out of every 17 farms studied, and about 2 percent had a many as 60 beef-type cows. Livestock production on Negro farms in Northeast Mississippi, where it was undertaken, represented largely the sale of dairy steers and calves supplementing in most instances the sale of one or two beef-type cows. A few sheep and goats were raised on the livestock, livestock-cotton, and general farming systems, but were not important as a commercial enterprise on any of the farms studied. Some hogs were raised on the majority of farms of all farming systems and in all soil areas. More than one brood sow per

Table 11. Average acreage of important crops grown for different farming systems and different soil areas, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Average acreage per farm in			Percent of crop area in cotton
		Cotton	Corn	Hay	
All farms	136	9	11	8	30
System of farming:					
Cotton	26	15	12	8	40
Cotton-livestock	22	10	12	6	31
Cotton and livestock	14	8	10	6	30
Livestock	17	6	12	12	18
Livestock-cotton	15	10	13	10	28
Cotton-dairy	5	8	14	2	30
Dairy-cotton	3	6	13	15	18
General	34	6	9	6	28
Soil area:					
Northeast Prairie	42	10	10	10	31
Northeast Highlands	38	7	10	4	29
Flatwoods	56	10	12	9	30

Table 12. Livestock numbers on farms grouped according to system of farmng and major soil area, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Average number for farm year per farm[1]							
		Dairy cows	Heifers and calves	Bull and steers	Other cows	Work-stock	Brood sows	Other hogs	Poultry
All farms	136	7	4	1	1	3	1	4	41
System of farming:									
Cotton	26	6	3	1	--	3	1	3	34
Cotton-livestock	22	6	3	2	--	4	1	4	48
Cotton and livestock	14	7	4	2	[2]	4	2	5	38
Livestock	17	10	5	2	2	3	2	7	52
Livestock-cotton	15	9	9	2	4	4	2	6	45
Cotton-dairy	5	7	3	2	--	4	1	5	32
Dairy-cotton	3	12	7	1	--	4	2	13	44
General	34	6	2	1	[2]	3	1	3	37
Major soil area:									
Northeast Prairie	42	7	3	1	[2]	3	1	5	40
Northeast Highlands	38	6	3	1	[2]	3	1	4	40
Flatwoods	56	8	5	1	2	4	1	4	43

[1] Excludes a few sheep and goats on livestock, livestock-cotton, and general farms.

[2] A few herds of beef cows were reported on a very small number of widely scattered farms.

rm was found more frequently on the tton, livestock-cotton, livestock and airy-cotton farms than on farms involvg other systems of farming. The hog nterprises were restricted to producon for home use on the majority of rms. Where hogs were grown for the arket, it reflected the efforts of farmrs to utilize grain produced in excess f the needs of dairy cattle. The poultry nterprise, found on all farms, was rgest on the livestock farms where ggs were sold during the period of high roduction plus the sales of fryers and ulled hens. Most poultry flocks were or home use. A few farmers kept, in ddition to chickens, a small number of urkeys, geese, ducks or guineas.

During the year, considerable change ook place in livestock numbers. Farmrs all over Mississippi were increasing he numbers of cattle and sheep, but ecreasing the numbers of workstock, oultry, and hogs. These changes genrally represented the continuation, with ertain modifications, of livestock trends lready in progress. These modifications nvolved the extension of trends in numers of various classes of livestock which vere apparent in 1950. Higher feed prics, resulting from the adverse producion situation during 1951, were forcing squeeze on further livestock expanion, particularly for the kinds which vere heavy users of concentrates. But avorable veal and lamb prices were nticing farmers to continue the expanion of beef cattle and sheep. Such an xpansion was further argumented by he fact that sheep and cattle have low eed requirements excepting pastures.

The total number of livestock on farms tudied increased from an average of 4.2 animal units at the beginning of the ear to 15.4 animal units by the ending f the year. There were fewer horses, nules, chickens and goats on these arms on February 29, 1952 than on arch 1, 1951, but more cattle, hogs and heep. These changes were in keeping with the livestock development which was taking place on Mississippi farms as a whole. An exception was in the hog enterprise where these farmers did not reduce the number of older breeding stock in the face of the high price of corn as was generally done in the State. During the year, horses declined 7 percent in number and mules 1 percent, on the farms studied, compared with decreases of 14 percent for horses and 5 percent for mules in the State. Dairy cattle made a relatively small change in numbers (declined 1 percent), suggesting perhaps that farmers intended to hold their dairy herds at about the same level as in 1950. Cattle other than dairy cows, however, increased 26 percent for beef cows, 130 percent for heifers, 26 percent for steers, and 3 percent for bulls. Hence, the major emphasis was on increasing breeding stock. Similar increases occurred in the hog enterprises, but for the State hogs declined 6 percent.[10] All poultry declined 22 percent, and goats, 42 percent.

Composition of the Farm Labor Supply

Composition of working force. The typical Negro farmer in this area had, besides his own labor, several months of family labor during the year. On most farms, however, the farmer did most of the work himself unless he had several cropper families on his farm. Cropper labor was utilized widely on the large farms. Some hired labor was necessary during the peak labor seasons on most farms, particularly during cotton chopping and again during harvest.

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[10] For Mississippi's livestock situation during 1951, see "Mississippi Livestock and Poultry Reached Record Value of $256 Millions," office of State Statistician, Bureau of Agricultural Economics, U. S. Department of Agriculture, Gulfport, Mississippi, March, 1952. Also see R. J. Saville, "More Cattle and Sheep; Fewer Hogs in State," **Mississippi Farm Research,** a monthly publication of Mississippi Agricultural Experiment Station, State College, Mississippi, Vol. 15, **No.** 3, p. 8, March, 1952.

Table 13. Composition of labor force on farms grouped according to system of farming, and soil areas, Negro owner-operated farms, Northeast Mississipi, 1951.

System of farming and soil area	Number farms	Man-equivalent months of labor per farm					Percentage of labor by			
		Total	Operator	Family	Cropper	Hired	Operator	Family	Cropper	Hired
All farms	136	14.6	7.3	4.4	2.1	0.8	50	30	14	5
System of farming:										
Cotton	26	19.7	7.5	4.1	6.9	1.2	38	21	35	6
Cotton-livestock	22	14.7	7.8	4.4	1.8	0.7	53	30	12	5
Cotton and livestock	14	18.3	8.1	6.4	2.4	1.4	44	35	13	8
Livestock	17	12.2	7.5	3.1	0.6	0.9	62	25	5	8
Livestock-cotton	15	14.1	7.3	4.8	1.1	0.9	52	34	8	6
Cotton-dairy	5	15.5	10.3	3.2	1.6	0.4	66	21	10	3
Dairy-cotton	3	18.3	10.3	7.0	--	1.0	56	38	----	6
General	34	10.3	5.4	4.4	0.1	0.4	52	43	1	4
Major soil area:										
Northeast Prairie	42	14.2	7.3	3.2	2.3	1.4	52	22	16	10
Northeast Highlands	38	13.0	7.6	3.8	0.7	0.9	58	29	5	7
Flatwoods	56	16.0	7.0	5.7	3.0	0.4	44	36	19	2

The amount of labor that farmers hired varied from year to year depending on he climatic conditions prevailing during he growing seasons and also on the levels of cotton yields obtained. During a wet year, as was true early in 1951, more grass than usual was encountered and therefore more hired help was needed in chopping and hoeing the cotton crop than in a normal year. If cotton yields are unusually favorable, a relatively large amount of labor is ordinarily hired to help the farmer and members of his family harvest the crop. A limited amount of labor is normally hired in August and September of each year to help in the hay harvest. Negro farmers in this area did not hire year-round labor because the farming systems and volume of business that prevailed did not permit profitable employment, except for family labor, during the slack seasons.

On the typical Negro owner-operated farms in Northeast Mississippi approximately 15 months of labor were used in operating the business during 1951, Table 13.[11] The variation was from an equivalent of 1.3 months to 109.2 months. Of the total months of labor utilized on farms in the area, about 50 percent was furnished by the farmers, 30 percent by members of their families, 15 percent by croppers, and 6 percent by hired help during rush seasons. The typical farmer worked about 7 months during 1951, and members of his family worked the equivalent of 4.4 months. Most of the family labor, especially the field work, was during 4 months of the year when the children were out of school. Some labor was contributed by the children all during the year. In the winter this was largely chore work, such as milking the cows before school in the morning and in the evening after school, particularly on farms having large dairy herds.

Significant differences were apparent in the composition of the labor force for different farming systems. For example, croppers were not used at all on the dairy-cotton farms and were not widely used on the general and the livestock farms. Croppers were most numerous on cotton farms where they were responsible for more than one-third of the total months of labor used in operating the farm. Cropper labor was also important on the other farming systems where cotton was the major cash enterprise. Farmers having the general system of farming spent less than half of the year working on their farms. Farmers worked more months on their respective farms throughout the year when they included commercial dairying as the primary or as the secondary source of cash income. The wife and children furnished more months of work on farms specializing in dairying. This was true because dairying required attention during the entire year and, therefore, furnished farm employment across the slack labor months when the labor would otherwise have been idle. The average labor requirement was highest for farms in the Flatwoods and lowest for those in the Northeast Highlands. Very little cropper labor was used on farms in the Northeast Highlands. Hired labor was most important in the Northeast Prairie.

Source of productive-man labor. Negro farms studied in Northeast Mississippi averaged 350 productive-man-work units during 1951, Table 14. This represented the total labor requirement under average working conditions, expressed in terms of 10-hour work days. It included all labor utilized in the direct production of crops and livestock enterprises, plus any other productive work which added to the income of the farms. Almost one-half of the productive-man labor on farms of the area was utilized on crops, mainly in cotton growing.

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[11] The work of women and children was reduced to its equivalent in full-time man labor. The procedure for the conversion of this labor to man work is given in the appendix.

Table 14. Distribution of productive-man labor on farms grouped according to system of farming and major soil area, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Productive-man-work units per farm: Total	On crop	On livestock	Other[1]	Percentage of productive-man-work units on: Crops	Livestock	Other[1]	Productive-man-work units per worker	Crop acre per worker
All farms	136	350	170	130	50	49	37	14	288	25
System of farming:										
Cotton	26	349	207	103	39	59	30	11	218	23
Cotton-livestock	22	353	212	113	28	60	32	8	295	26
Cotton and livestock	14	306	158	127	21	51	42	7	204	18
Livestock	17	378	140	189	49	37	50	13	378	31
Livestock-cotton	15	395	193	188	14	49	48	4	329	29
Cotton-dairy	5	303	163	121	19	54	40	6	233	20
Dairy-cotton	3	360	124	227	9	34	63	3	225	22
General	34	342	131	102	109	38	30	32	428	29
Major soil area:										
Northeast Prairie	42	347	169	132	46	49	38	13	289	27
Northeast Highlands	38	302	139	109	54	46	36	18	274	22
Flatwoods	56	385	192	143	50	50	37	13	283	24

[1] Largely labor off the the farm by the farmer including the use of hismachinery and equipment in doing custom work for his neighbors and nonfarm work requiring the use of his truck.

More than one-third of the labor was used for livestock. Other productive work, largely in the form of custom work off the farm for neighbors and non-farm work in the nearby urban areas, accounted for the remaining 14 percent of the man work units used in farm businesses.

Of importance is a comparison of the allocation of the productive work furnished by the farm business over crops, livestock and other productive activities among the farms similar with respect to the system of farming on the one hand and the soil area on the other. Farming systems involving livestock and livestock products as the leading source of cash income had a very large proportion of the productive labor expended on livestock. Dairy-cotton farms had about 63 percent of the man labor furnished by the farm business expended on livestock, largely for the dairy enterprise. About half of the man labor on the typical livestock-cotton farm and the livestock farm was used on livestock enterprises. A relatively large share of the man work was generally used for crop production where the cotton crops furnished the major share of the income. On general farms, man labor was distributed almost equally among crops, livestock, and other productive activities. These farmers used a large amount of off-farm employment in near-by urban areas to supplement farm employment in an effort to attain a larger volume of business. The typical farm in each of the three soil areas did not vary significantly in the distribution of man work among crops, livestock and other endeavors.

Each worker, on the average, accomplished 288 ten-hour days of productive work, or man-work units, and handled the equivalent of 25 acres of crops on the farm during the year. Some work was also expended in caring for workstock and repairing fences and buildings and making other improvements. Such work was not considered productive work, and therefore, has not been considered in the organization of the labor force on farms studied. The least efficient farming system, in terms of the amount of work each worker accomplished in the acres of crops each worker handled, was the cotton and livestock system. The three farming systems highest in labor efficiency were general, livestock and livestock-cotton. Farmers in the Northeast Highlands section of the area had a lower average labor efficiency, while those in the Northeast Prairie averaged highest in that respect.

Farm Capital Investment

The total capital investment in the farm business and its allocation among real estate, equipment, livestock, and feed and supplies, showed considerable variation for systems of farming and soil areas. The investment in real estate was based on each farmer's estimate of the value of land he owned, including buildings and other improvements. No change was made in the value of land unless improvements, purchases, or sales of land were made during the year.

As indicated in Table 15, the average capital investment per farm amounted to $7,328, with variations from $1,002 to $50,932. Two-thirds of the total capital was investment in land and buildings—real estate. The average value of real estate (13,928 acres in study) land was around $48 per acre. Twenty-four percent was estimated at less than $30 per acre, while 13 percent was valued at $75 or more. Land values were highest in the Northeast Prairie and lowest in the Flatwoods. The average value of land was $66 per acre in the Northeast Prairie, $46 per acre in the Northeast Highlands, and $40 per acre in the Flatwoods. Twenty-two percent of the capital on Negro owner-operated farms was invested in dairy cows, other cattle, hogs, poultry, sheep, goats, and work animals. Farm equipment accounted for

10 percent of the capital invested; feed and supplies represented the remaining 3 percent.

In general, farming systems with livestock as the leading source of income had larger capital investments than general farms or farming systems involving cotton as the major cash enterprise. The largest capital investment was on the farms where dairying was the leading enterprise. Dairy cows required a large capital investment per dollar of income, most of which was needed for the dairy herd itself. Where beef cattle were kept, the capital per farm was considerably lower than on the farms where dairying was of major or minor importance, because beef cattle usually required a lower investment per head. On livestock farms which emphasized hogs and poultry, less capital was also invested. The portion of farm capital invested in real estate was greater on the cotton, cotton and livestock, and dairy-cotton farms than on other systems of farming. Farm equipment constituted the greatest proportion of the capital on the cotton and dairy-cotton systems, where more equipment was needed to accomodate the relatively large crop acreage. The value of livestock represented more of the farm capital on farms in which livestock was a part of the system.

Farmers in the Northeast Highlands were at a greater disadvantage in farm capital available than were those in the Flatwoods or in the Northeast Prairie. The prevailing pattern of relatively small capital investments among Negro owner-operated farms in the Northeast Highlands was due to the relatively small acreages in farms and in crops and partly to the small investments in equipment. As mentioned previously crop land averaged 10 acres less in the Northeast Highlands than in the Northeast Prairie and in the Flatwoods. The same general pattern was true for all land in farms. Machinery and equipment, including the farm share of automobiles and motor trucks, and tractors, averaged $808 per farm in the Northeast Prairie, $778 in the Flatwoods, and $475 in the Northeast Highlands.

Type of Power on Farms

Workstock was still the most important source of power on most farms in this area. The horses and mules used by farmers were mostly small. Mules predominated, since they were better adapted to the area and the kind of work. During recent years, remarkable progress has been made in the substitution of mechanical for animal power on farms. Mechanization on Negro farms probably has advanced further in Northeast Mississippi than in other Upland areas of the State. In this area 15 percent of the owner-operators, on whose farms the survey was made, used tractor power, all of which was in combination with workstock.

For the most part, farmers used two-mule and full-row equipment, in contrast to the one-mule and half-row equipment which is still prevalent in many Upland sections of the State. The equipment most frequently found on these farms included a wagon, a turning plow, a middle-buster, an iron-beam or wooden-beam straight or Georgia stock, a full-row cultivator, some kind of harrow, and a one-row planter, Table 16. In addition to this regular equipment, two-thirds of these farmers had mowing machines, about two-fifths had hay rakes and fertilizer distributors, and a third had a disc. A few farmers had such mule-drawn equipment as a stalk cutter, and a share in a cotton poison machine and a hay baler. Large, mule-turning plows, were commonly used in breaking the land. Two-mule walking cultivators predominated for cultivating row crops; riding cultivators were not used on any farms surveyed. On about one-fourth of the farms, the so-called "gee whiz" or the side harrow was still being used for cultivation. Such one-mule and half-row

Table 15. Average farm capital investment according to system of farming and soil area, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms in group	Average farm capital	Percentage of capital invested in			
			Real estate	Farm equipment	Live-stock	Feed and supplies
All farms	136	$ 7,328	65	10	22	3
System of farming:						
Cotton	26	7,796	68	12	16	4
Cotton-livestock	22	7,407	68	8	20	4
Cotton and livestock	14	6,540	63	9	25	3
Livestock	17	8,492	64	8	27	2
Livestock-cotton	15	8,310	60	7	30	3
Cotton-dairy	5	5,654	66	9	22	3
Dairy-cotton	3	12,977	67	12	20	1
General	34	5,965	63	11	22	3
Major soil area:						
Northeast Prairie	42	8,212	68	10	19	3
Northeast Highlands	38	5,703	65	8	24	3
Flatwoods	56	7,763	63	10	25	2

equipment did not permit the farmer to economize in the use of his labor and was no longer used by the most progressive farmers.

Most farmers owning tractors used them only for breaking the land and in haymaking, and continue to use mule-drawn equipment to cultivate their crops. Only 9 tractor-drawn cultivators were found on the 20 farms owning tractors, while practically all of these farms had a middle-buster, or a disc, or both. Half of these farms had mowing machines. Other items of auxiliary equipment were not widely used. The total number of tractor attachments in use on the farms with power equipment amounted to 17 middle-busters, 17 discs, 10 mowers, 9 cultivators, 7 breaking plows, 5 fertilizer distributors, 4 planters, 3 stationary-type hay balers, 2 hay rakes, 2 cotton poison machines, 1 lister, 1 section harrow, 1 lime spreader, and 1 trailer. Also, included were 2 hammer mills and 1 road scraper, all of which were found on one farm. Two grist mills and 2 power saws were found. Practically all of this tractor-drawn equipment was found on medium to large farms.

By furnishing transportation that would have otherwise been supplied by work animals, automobiles and motor trucks contributed to the substitution of mechanical for animal power on farms of this area, but apparently tractors were largely responsible for the decline in work animals. Around 37 percent of the farmers had either an automobile or a truck that was being used for farm purposes. One-fifth of all farms used automobiles in their farming operation; 22 percent of all farms used motor trucks. Few farmers had the services of both an automobile and a truck on the same farm. In addition, there were some farmers who owned trucks or automobiles which were not used at all on their farms. Some farmers who formerly had automobiles now were relying on motor trucks, especially pickups, for transportation. The usual automobile found on these farms was an 11-year old model Ford or Chevrolet; the usual truck was a 7-year old model Chevrolet.

Tennessee Valley Authority (T. V. A.) electrical power is available to every farm in the area at a reasonable rate, and home electrification is common on many farms. About 59 percent of the farms included in this study were electrified. Although electrical energy is

Table 16. **Kind, amount and value of farm machinery and equipment, Negro owner-operated farms, Northeast Mississippi, 1951.**

Mule-drawn equipment				Power-drawn equipment			
Item	Number having	Percent having	Average value each	Item	Number having	Percent having	Average value each
Wagon	127	93.4	$56	Motortruck (farm share)	30	22.0	$390
Harness	134	98.5	35	Automobiles (farm share)	27	19.8	189
Middle-buster	132	97.0	15	Tractors	20	14.7	903
Turning plows	127	93.4	11	Middle-busters	17	12.5	144
Straight or Georgia stock	129	94.8	5	Discs	17	12.5	139
Planters	119	87.5	20	Cultivators	9	6.6	192
Fertilizer distributors[1]	59	43.4	16	Lister	1	0.7	150
Half-row cultivators	35	25.7	5	Planters[1]	4	2.9	184
Full-row cultivators[1]	118	86.8	36	Distributors[1]	5	3.7	71
Section harrows	98	72.0	20	Planter and distributor	1	0.7	100
Stalk cutters	25	18.4	33	Section harrow	1	0.7	75
Discs[1]	50	36.8	37	Lime spreader	1	0.7	45
Mowers	83	61.0	63	Mowers	10	7.4	134
Hay rakes	54	39.7	35	Hay rakes	2	1.5	104
Hay balers[1]	6	4.4	93	Hay balers	3	2.2	373
Cotton dusters[1]	37	27.2	57	Cotton duster or sprayers[1]	2	1.5	140
Poultry equipment	4	2.9	8	Trailer	1	0.7	150
Dairy equipment	2	1.5	200	Hammer mills	2	1.4	140
Shop equipment	132	97.0	29	Grist mills	2	1.4	540
Small tools[2]	134	98.5	21	Road scraper	1	0.7	180
Accessories[3]	130	95.6	30	Power saws	2	1.5	165

[1] Some cooperative ownership was used with this equipment on a few farms.

[2] Includes shovels, post-hole diggers, hay forks, hoes, etc.

[3] Includes plow points, single-trees, and double-trees, planter plates, moldboards, cultivator points, sweeps and hill sweep, wrenches, plow handles, etc.

brought to more homes each year, the farmers have not learned to use this power, or the systems of farming are not suited to it, as a factor of production on their farms. Instead, electricity is used almost exclusively in the home for lighting, for the radio, and for the refrigerator.[12] Only one farmer had the service of a milking machine. The electric chicken brooder was found only on a very few farms.

Farm Receipts

Farm receipts, commonly called gross farm income, is the term used to measure total income earned from all farm sources during the year. It included money received from the sale of the current year's crops, livestock and livestock products, sale of equipment and supplies, rent received from land and buildings, government payments through the Production and Marketing Administration (now the Agricultural Stabilization and Conservation Service), the sale of timber and timber products, and work off the farm by the operator, including that of his workstock and the use of his machinery. In addition to the cash receipts, it includes all increases in the inventory values of farm capital at the end of the year over those at the beginning of the year. As shown in Table 17, the average farm receipts amounted to $2,126. Seventy-nine percent of the total was represented by cash receipts, and 21 percent by an increase in farm capital. This large capital increase[13] reflected the action of farmers in building up certain phases of their livestock enterprises, particularly cattle, in buying more tractors and other equipment, and in improving their buildings.

The largest single source of cash receipts usually came from the sale of cotton. Other crops were not important except as feed for livestock and food for family living. Milk sales constituted the second major source of cash receipts. Two-thirds of all farms sold milk, but sales averaged only $44 per milk cow. The sale of livestock, mainly cattle, was an important source of cash receipts on many farms. Cattle were sold on 72 percent of the farms, hogs on 48 percent, and poultry on 32 percent. About one-third of all farmers spent part of their time at work off their farms, either on other farms or in some non-farm occupation. A few of these farmers used their truck, tractor, or team in off-farm employment. On approximately one-fourth of the farms some timber or timber products were sold.

The farm receipts varied significantly with system of farming and soil area, reflecting the differences that prevailed in cotton yields and in volume produced, and in the commercial importance of the dairy and the livestock enterprises. Also, variations were influenced by the amount of productive work such as custom work off the farm for neighbors and nonfarm work in the near-by urban areas. A part of the variation in receipts resulted from differences in the size of business. Cotton, livestock and livestock-cotton farms showed higher farm receipts than other farming systems. The lowest farm receipts were usually obtained on cotton-livestock and cotton-dairy farms. Farm receipts averaged highest in the Northeast Prairie and lowest in the Northeast Highlands.

Farm Expenses

Farm expenses indicates all cash expenses of operating the farm business during the year, an allowance for unpaid family labor and decreases in farm capital. They do not include an allowance for interest on the farm investment and the estimated value of the operator's

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[12] This position is supported by a comprehensive study already made. See Gaines, J. P., and Davis, Joe F., "Electricity on Farms in the Clay Hills Area of Mississippi," Mississippi Agricultural Experiment Station Bulletin 493, August 1952, p. 36.

[13] Gross rather than net increase.

Table 17. Average farm receipts according to system of farming and soil area, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Average farm receipts	Source of farm receipts								
			Cotton	Other crops	Milk and cream	Cattle	Hogs	Poultry and eggs	Other live-stock[1]	Miscellan-eous income[2]	Increase in capital[3]
All farms	136	$2,126	$ 795	$30	$266	$204	$ 47	$26	$14	$298	$446
System of farming:											
Cotton	26	1,572	1,637	55	126	133	23	20	8	284	284
Cotton-livestock	22	1,675	893	9	195	127	22	28	6	180	305
Cotton and livestock	14	1,894	898	14	260	288	123	21	3	121	166
Livestock	17	2,290	267	32	474	387	103	51	43	347	585
Livestock-cotton	115	2,421	692	8	470	276	61	34	40	60	778
Cotton-dairy	5	1,622	830	9	424	72	40	9	2	115	121
Dairy-cotton	3	1,888	382	3	857	325	93	12	42	3	223
General	34	1,997	387	47	153	159	14	18	5	586	630
Major soil area:											
Northeast Prairie	42	2,567	988	35	317	174	67	31	14	302	639
Northeast Highlands	38	1,756	606	48	259	104	33	19	9	275	404
Flatwoods	56	2,047	780	15	232	295	42	25	24	307	332

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[1] Receipts from the sale of workstock, sheep and wool, goats, and breeding fees collected.

[2] Off-farm work of oprator including his workstock and machinery, sale of timber and equipment, rent received, and government payments through the Production and Marketing Administration (now Agricultural Stabilizaion and Conservation Service.)

[3] Does not include decreases which may have occurred on the same farms. All decreases have been handled as expenses, rather than a net increase or decrease for the entire farm.

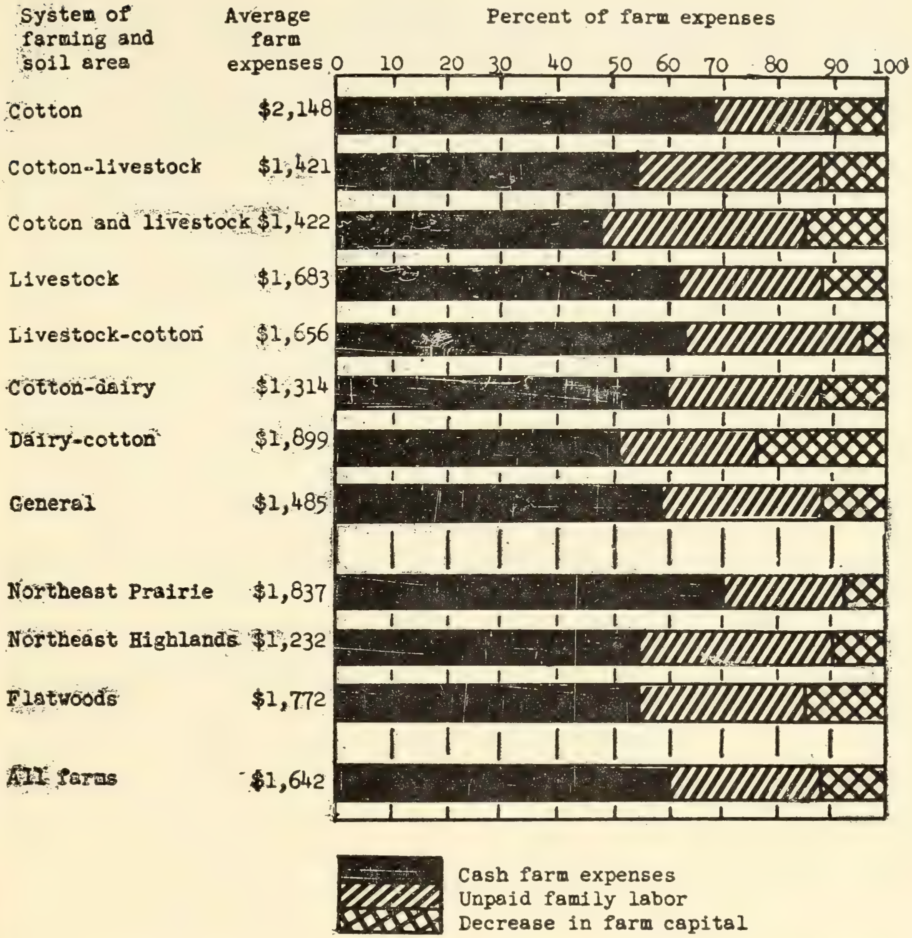

Figure 7. Percentage distribution of farm expenses on different farming systems and in different soil areas.

labor. Household or personal expenses are not included as they do not constitute expenses of the farm business. The average farm expense was $1,642, Figure 7, and ranged from $104 to $16,174. Cotton farms had the largest and cotton-dairy farms had the smallest expenses. Farmers in the Northeast Highlands operated with considerably smaller average farm expenses than did those in the Northeast Prairie and in the Flatwoods.

Three-fifths of the total farm expenses represented cash costs, i. e., payments for labor, feed, fertilizer, seed, poison, livestock, materials, supplies, taxes, insurance, repairs and parts, oil, gasoline, and miscellaneous items. The remaining two-fifths constituted non-cash expenses, or the estimated value of labor performed by the family, depreciation of improvements and equipment, and all decreases in inventories of livestock, feed, and supplies from the beginning to the ending of the year.[14] Cash costs were highest

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[14] Gross rather than net decreases.

Table 18. Distribution of cash expenses on farms grouped according to systems of farming and soil areas, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Average cash expenses	Percentage of cash expenses spent on							
			Crops	Livestock	Labor	Equipment bought	Power equipment expenses	Real estate improvements	Rent	Others
All farms	136	993	19	25	15	14	9	10	3	5
System of farming:										
Cotton	26	1,466	18	9	35	10	10	7	3	8
Cotton-livestock	22	766	27	26	13	4	8	11	4	7
Cotton and livestock	14	691	25	25	15	2	10	7	6	10
Livestock	17	1,040	14	45	7	10	10	2	3	9
Livestock-cotton	15	1,051	20	37	5	25	3	2	2	6
Cotton-dairy	5	789	18	27	9	----	15	16	7	8
Dairy-cotton	3	971	16	33	3	15	15	4	12	2
General	34	882	14	25	4	25	8	17	1	6
Major soil areas:										
Northeast Prairie	42	1,294	14	23	14	17	10	11	5	6
Northeast Highlands	38	676	19	23	9	20	6	14	2	7
Flatwoods	56	979	23	28	20	8	9	4	1	7

for the cotton farming system and lowest for farms where cotton and livestock were given somewhat equal emphasis. In the Northeast Prairie, cash costs accounted for two-thirds of the farm expenses, compared with 50 and 57 percent, respectively, in the Northeast Highlands and in the Flatwoods.

The usual proportions of major items of cash farm expenses are shown in Table 18. Except for cotton farms, the most important cash costs were those spent on the livestock enterprises. Livestock expenditures were highest on those farms where about 45 percent of cash expenditures were for livestock. Most of the livestock expenses represented feed and livestock purchases. Farmers emphasizing livestock production and dairying also had larger expenditures for sanitation, veterinary services, and disease control. Charges for milk hauling were largest on the dairy-cotton farms. The next largest expenditures were for crop production. Crop expenses included payments for fertilizer, seed, poison, and ginning charges for cotton. Expenditures for crop production were larger than livestock expense on farms with cotton as the major cash enterprise. An exception was noted on farms involving cotton as the primary source of income and dairying as secondary, due to the large amount of feed bought on these farms plus fairly large charges for milk hauling. The large crop expense on cotton farms was due to the relatively greater dependence on purchased seed, high expenditures for insect control and ginning charges. The purchase of commercial fertilizer was a large item in the classification of crop expense on all farming systems except general farms. Labor charges constituted a very large proportion of cash expenditures. Most of the cash labor charges were those for cropper labor, especially on cotton farms. Cash labor charges were not large on farms emphasizing livestock or on general farms, because unpaid family labor was so significant. Since very little cropper labor and not so much hired help was used on farms in the Northeast Highlands, cash expenditures for labor were lower in this soil area than in the Northeast Prairie and in the Flatwoods.

Farmers had relatively large expenditures for equipment purchases, which reflected the extent to which the farms were being operated with well-adapted equipment. Farms with the largest amount of equipment purchases were those involving livestock-cotton and general farming systems located in the Northeast Highlands. Construction and maintenance of buildings and fences, and other real estate improvements accounted for a large proportion of farmers' cash expenditures on many farms. Rent was a large item of cash expense for dairy-cotton farms. It was a noticeable cash expenditure on many farms in the Northeast Prairie where renting in additional land was widely used to increase the size of farm business.

The combined costs for all other items of cash expenditures amounted to 5 percent. The largest items in this group were taxes, blacksmithing and repairs to farm equipment, insurance on the dwelling, and interest on funds borrowed for operating expense.

Farm Returns

Operating a farm business is a complex process because it requires the farmer to perform the roles of an investor, a manager, and a laborer simultaneously. Several methods or measures can be used to determine the earnings accruing to the farmer for each of his separate but closely related roles. The amount of return to any one role can be arrived at only when allowances for returns are made in advance for the other roles. It depends then on which one of these is being studied. Items which will affect such a return and must be met in making calculations include: all farm expenses, including interest paid on money advanced for operating expenses; interest at 5 percent on the capital invested; and reasonable wages to the farmer for his labor. Not all farms had sufficient incomes to meet all of these criteria, therefore, many had minus returns.

The measures of financial performance of farms studied are shown in Table 19. For the purpose of the study only five measures have been used. Some people, especially typical farmers, think that what they have earned during the year is the difference between what was taken in from the sales of farm products and what was paid out for farm operating expenses. Others make an allowance for the increases or decreases in livestock, feed and supplies on hand from the beginning to the end of the year in arriving at their incomes. Consideration has been given to both of these points in this study.

Cash farm income. The cash farm income, obtained by deducting cash expenditures from cash receipts, represents the amount of money available for personal spending, debt servicing, and for savings and investments. The average cash farm income on these farms was $688. Some farming systems produced considerably greater cash farm incomes than others. For instance, farms of the cotton and livestock systems had average cash farm incomes of $1,037, while those having the general system of farming averaged only $485. In the Flatwoods the average cash farm income was slightly higher than in the Northeast Highlands, and about $100 higher than in the Northeast Prairie.

Operator's farm income. Operator's farm income is determined by subtracting the cash and non-cash expenses from the total farm receipts. It represents what the farmer has available for his labor and management and the use of capital invested in the farm business. This averaged $484 per farm, Table 19. In addition to this average sum, the farmer had the use of a farm dwelling and all farm products furnished by the farm for family living. Above average farm income was achieved by the typical farmer operating livestock, livestock-cotton, and general farms. Also, farmers in the Northeast Prairie had higher farm incomes than those in the Northeast Highlands and in the Flatwoods.

Operator's labor income. This measure is determined by deducting from operator's farm income interest at 5 percent of the average farm investment. Operator's labor income was $118, which is the amount which the average farmer in the area received for his labor and management, in addition to the use of a house and farm commodities consumed by the household. The dairy-cotton farms had a minus labor income of $659, and the cotton-livestock farms showed a minus labor income of $26, Table 19. The average Negro farmer in the Flatwoods had a minus labor income of $113, for his own time and management. To say that a farmer made a minus labor income means that he failed to realize income for the time he spent working on his farm during the year, but that he also lacked that much of receiving interest at the rate of 5 percent for the use of the estimated capital invested in his farm. The typical farmer in the area made a fairly comfortable living despite the low labor income, because the non-cash expenses represented two-fifths of the total farm expenses. Also, a large amount of products was furnished by the farm for family living, and debts were small. Hence, the operator's labor income does not always show the actual returns to a farmer. Its use as a measure of success in farming in this area ranks secondary to operator's earnings, when it is intended to show the total returns to the farmer for labor and management.

Operator's labor earnings. If the use of a house and the value of products furnished by the farm for family living

Table 19. Comparison of farm returns on different farming systems and in different soil areas, Negro owner-operated farms, Northeast Mississippi, 1951.

System of farming and soil area	Number of farms	Cash farm income	Operator's farm income	Operator's labor income	Operator's labor earnings	Percent earned on average capital
All farms	136	$ 688	$484	$118	$1,054	—3.3
System of farming:						
Cotton	26	822	424	34	947	—4.9
Cotton-livestock	22	999	344	—26	994	—5.5
Cotton and livestock	14	1,037	472	145	1,177	—2.8
Livestock	17	665	607	182	1,108	—1.5
Livestock-cotton	15	592	765	349	1,352	0.3
Cotton-dairy	5	712	308	25	767	—11.5
Dairy-cotton	3	649	—11	—659	124	—6.4
General	34	485	512	214	1,091	—1.9
Major soil areas:						
Northeast Prairie	46	634	730	319	1,146	—0.5
Northeast Highlands	38	676	524	239	1,070	—4.0
Flatwoods	56	736	275	—113	976	—5.1

are added to the operator's labor income, the figure obtained is called the operator's labor earnings. The average farmer had labor earnings of $1,054 during 1951. The lowest labor earnings obtained by any farmer was minus $993, which meant that the farmer failed by this amount to make farm expenses and interest on the invested capital, even though credit had been given for the use of the farm house and products furnished by the farm for family living. The highest labor earnings achieved by a farmer in the study amounted to $4,758. On one highly specialized farm in the area the operator's labor earnings approached $10,000, but this farm was not included in the analysis because its organization and operation was so much different from that of any other Negro farm.

The usual labor earnings attained on the several farming systems differed widely. The highest earnings were obtained on farms generally involving livestock production as the major cash enterprise and cotton as secondary. On this system of farming, the labor earnings averaged $1,352 per farm. Specialized dairy-cotton farms achieved labor earnings averaging only $124. None of these farms produced earnings as high as $1,000, the minimum for a fairly acceptable standard of living. General farms produced earnings that were about average for the area. Other farming systems with earnings about average or above included the cotton and livestock and the livestock farms. Cotton, cotton-livestock, cotton-dairy, and the dairy-cotton farms all produced labor earnings that were below average. Although the cotton farms had earnings that averaged lower than some other farming systems, it is important to note that the variation among the different cotton farms was from $603 to $4,488, and such a range in labor earnings was second only to that occurring among the general farms. Hence, it would seem that differences in factors of farm organization and operation had a greater effect on earnings on cotton and general farms than on any other farming systems.

Labor earnings were highest in the Northeast Prairie and lowest in the Flatwoods. There were farmers in each soil area who failed to cover all farm expenses and interest on capital, as evidenced by the existence of minus labor earnings. For the three soil areas, the average labor earnings obtained by farmers were $976 in the Flatwoods, $1,070 in the Northeast Highlands, and $1,146 in the Northeast Prairie. No farmer situated in the Northeast Highlands achieved earnings as large as $3,000. Earnings of less than $1,000 were achieved on three out of every five farms in the Flatwoods, but earnings this small were obtained on only four out of every nine farms in the Northeast Prairie. In the Northeast Highlands half of the farms produced earnings of less than $1,000.

Percent earned on average capital. The percent earned on capital investment is a measure of return for the use of farm capital. It is determined by deducting from operator's farm income, an allowance for the farmer's labor, and expressing this as a percent. On this basis, the typical farmer failed to earn anything on the capital invested in the farm business. Instead, a 3.3 percent loss was incurred on the average capital investment. The farmers probably over-estimated considerably the value of their time. Insofar as this was done, the amount earned on capital would be less by the same amount that the value for the farmer's labor was over-estimated. The typical Negro farmer is so much a laborer as compared to his position as investor, and he operated with such a limited amount of capital, that the percent earned on capital is of little value in describing his operating success. Operator's labor income and operator's labor earnings are better measures of farm returns as the return to labor is relatively more important to the farmers of the area than return to their capital.

Influence of Organization And Operation Of Farms On Earnings

It has been shown in numerous farm management studies that there are many reasons why some farmers succeed while others fail even in the same community. Some of these causes of differences in earnings arise because of forces over which the individual farmer has little control. For example, a farmer has no control over the amount of rain that falls on his farm; the quality of soils constituting his land; and the element of chance which may be reflected in such things as lighting striking his finest cow, a livestock disease infecting his livestock but not his neighbor's, a destructive fire accidently starting. Considerable attention has already been given in a preceding section to the conditions under which the farmer's earnings depend on these elements outside his **control.**

In this section primary consideration is directed to an analysis of conditions influencing farm earnings which are within the control of an individual farmer. A farmer has an opportunity of making decisions about the organization and operation of his farm; the kind, number, and quality of livestock kept; the kind and amount of cash crops and feed crops grown; the manner in which the crops and the livestock are handled; and the efficiency with which the available labor and equipment are used. These factors will differ in their influence on earnings in the several type-of-farming areas of the State, making it necessary in each separate farming area to conduct studies so as to ascertain the particular association of the various factors with earnings under a given set of conditions. The more accurately a farmer is able to acquire, analyze, and use information in making management decisions concerning all parts of the farm business, the greater will be his chances of achieving favorable earnings.

Causes of variations in farm earnings, insofar as they are within the control of the individual farmer, will be considered under the three main functions of a farmer's problem as a manager. They are (1) size of business; (2) farm organization, which includes the problem of selecting and combining the crops and livestock enterprises of the farm business in the manner that will be suited to the conditions under which the farm is operated; and (3) farm operation, which has to do with the technical farm practices followed regarding economy in the farm production and the efficiency achieved in handling the overall farm business. These three functions of managing a farm business are interrelated in that their influence on a farmer's earnings is joint rather than separate. For example, the amount of cotton which a farmer produces per acre or the pounds of milk he obtains per cow are not entirely results of farm practices he followed in operating his farm. They may very well be associated with the size of business he is farming and also with the adaptation of the organization to the local farming conditions. Furthermore, the size of business is important, but a large business poorly organized and operated may result in a loss.

The analysis of the several factors which influence the earnings obtained by the farmers of this area will show for each factor the following: (1) the variation in the factor from farm to farm, (2) the association of the particular factor with other factors in the organization and operation of farms, and (3) the relationship between the factor and earnings.

Size of Farm Business

Differences between farms in size of business are of paramount significance in accounting for variations in earnings on farms included in this study. It is borne out by numerous farm management studies over a considerable period of years that generally the farms somewhat larger than average for any area pay better over a period of years than smaller farms. The way size of farms affects farm earnings, however, varies from one year to another. During years when prices received by farmers for the products which they sell are favorable and also during years when good yields are obtained, large farms with good rates of production usually produce relatively the highest earnings and small farms with poor rates of production produce the lowest earnings. Large farms during such a period are usually able to still achieve fairly favorable earnings even though their yields might have been relatively low. Since the size of farm acts as a multiplier for loss as well as for profit, it follows that the larger farms stand to suffer the greatest losses during years in which prices relative to costs are unusually unfavorable and also during periods in which weather conditions have caused poor yields. Regardless of the weather or economic conditions, the way size of farms affects earnings will depend in part on how well other phases of farm organization and operation are developed. Other factors may out-weigh the influence of size in particular cases.

The best-suited measure for delineating the size of a given farm or a group of farms depends on the degree of uniformity in the relative intensity of the usual enterprises included in the farming systems, in soil types, in the utilization of labor, in the usefulness of land, and in the methods of disposing of the crop and the livestock enterprises. The total labor requirement, expressed in productive-man-work units on a farm, is the most satisfactory measure to be used in delineating size because it measures the amount of productive labor furnished by the farm business, regardless of the system of farming or the intensity of the crop and livestock enterprises.[15] Although it is the most difficult measure of size to compute when a group of farms is involved, it has the special advantage of being the only indicator of size that puts on an equal footing such essentially different operations as, for instance, a cotton farm and a livestock farm.

Thus, the number of productive-man-work units has been employed for the purpose of studying the association between size of business and earnings of farms included in this study. For the sake of comparing the corresponding effect on farm earnings or on farm organization and operation, acres in the farm will also be shown, along with the primary measure of size.

The size of the farming operations varied from farm to farm, regardless of the measure of size used. A wider variation, however, occurred in the size of the farm business when delineated by the number of productive-man-work units than when measured by acres in the farm. The productive-man-work units utilized on the individual farms included in the study ranged from 52 on the farms with the smallest volume of business to 2,613 on the farms with the largest volume. This represented a range of from 15 to 746 percent of the average on all farms, 350 productive-man-work units. More than four-fifths of the farms, 82 percent, ranged in productive-man-work units from 100 to 499, i. e., from small to medium large size. Only 4 percent of the farms exceeded 800 productive-man-work units. Such a size of business was considered extra large for Negro farmers in Northeast Mississippi. The farms ranged in size, as delineated by the number of acres per farm, from 17 to 665 acres. The extent of such a variation is reflected in a range of 17 to 652 percent of the average size of farm. Seventy-three percent of the farms were of 30 to 149 acres in size; 28 percent of the farms included approximately 72 acres. Only 8 percent of the farms exceeded 200 acres.

Relation of size of business to farm organization and operation. A direct relationship existed between the two selected measures of size and other measures of farming operations, Table 20. This

Table 20. Various measures of size of business on farms grouped according to productive-man-work units and acres in farms, Negro owner-operated farms, Northeast Mississippi, 1951.

Size of business	Number of farms in group	Average productive man-work units	Average number of farm workers	Acres in farm	Crop area, acres	Productive animal units	Average farm capital
Productive-man-work units:							
Under 100 (very small)	7	71	0.4	37	6	1.8	$ 2,062
100-199 (small)	27	147	0.9	63	16	3.8	3,620
200-399 (medium)	61	293	1.1	92	26	9.2	6,567
400-499 (medium large)	24	433	1.2	117	34	12.0	7,168
500-799 (large)	11	613	1.9	135	54	17.8	13,639
800 or more (extra large)	6	1,366	3.1	342	104	58.1	26,909
Acres in farm:							
Under 30	11	187	0.6	22	13	3.6	3,382
30-49	21	214	0.9	37	15	5.4	3,494
50-89	38	259	1.2	72	23	6.8	5,593
90-119	23	342	1.1	101	30	11.6	6,462
120-149	18	357	1.3	125	39	11.3	7,362
150-199	14	492	1.6	169	145	17.1	11,559
200 and up	11	877	2.2	293	67	35.1	19,882

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[15] The measure of productive-man-work units on a farm is defined and the method of its computation is outlined in the Appendix.

Table 21. **Relation of size of business to farm organization and operation, Negro owner-operated farms, Northeast Mississippi, 1951.**

Productive-man-work units	Number of farms in group	Percentage of productive-man-work units on			Percentage of labor by				Productive-man-work units per 100 acres in farm	Productive-man-work units per $1,000 invested
		Crops	Livestock	Others[1]	Farmer	Family	Croppers	Hired		
Under 100 (very small)	7	52	38	20	60	33	----	7	192	34
100-199 (small)	27	65	28	7	65	29	4	2	233	41
200-399 (medium)	61	49	38	13	57	26	9	8	318	45
400-499 (medium large)	24	45	34	21	48	39	8	5	370	60
500-799 (large)	11	45	34	21	34	39	20	7	454	45
800 or more (extra large)	6	48	46	6	23	25	50	2	400	51

Productive-man-work units	Percentage of tillable land in cotton	Percentage of cash receipts from			Crop area per work animal	Equip-ment per acre in crops	Acre in crops per worker	Productive-man-work units per worker	Crop yield index	Gross return per $100 of gross expenses
			Livestock and livestock products							
		Cotton	Total	Milk						
Under 100 (very small)	25	59	28	4	4	$14	14	176	48	$ 59
100-199 (small)	36	63	32	16	5	19	18	163	85	89
200-300 (medium)	38	44	37	18	8	20	23	266	105	133
400-499 (medium large)	43	36	39	20	9	20	29	361	91	125
500-799 (large)	50	49	25	12	10	31	28	323	104	135
800 or more (extra large)	48	60	27	11	11	30	33	440	95	151

[1] Largely labor off the farm by farmers including the use of their machinery and equipment in doing custom work for their neighbors as well as non-farm work requiring the use of their trucks.

indicates a closer correlation of productive-man-work units, compared to acres in the farm, with other measures of size, particularly the investment in farm capital, productive animal units, crop acres, and the number of full-time man equivalent workers. A contrast of the very small farms of approximately 71 productive-man-work units with the extra large farms of approximately 1,366 productive-man-work units, shows that farm capital varied from $2,062 to $26,909, productive livestock increased from 1.8 to 58.1 animal units, crop area from 6 to 104 acres, land in farms increased from 37 to 342 acres, and the man-equivalent workers per farm increased from 0.4 to 3.1.

Certain major elements in farm organization and operation are presented for farms studied, when grouped on the basis of size of business, Table 21. Differences in size of business had noticeable effects on the allocation of the productive work furnished by the farm business over crops, livestock and other productive endeavors that added to the income. As the size of business increased, the proportion of work expended on the livestock enterprises increased considerably, but the proportion of the work utilized on crops was not materially affected, except on small farms where more than half of the work was on crops, mainly cotton. Productive work largely in the form of custom labor off the farm for neighbors and nonfarm work in the near-by urban areas was of greatest importance to farmers operating very small, medium-large, and large farm business units. For the very small farms, this represented an effort on the part of many farmers to make use of some of their spare time in doing nonfarm[16] work between the time the crops were "laid by" and the time harvesting began, and also work during the winter months when there was little to do on their small farms. In the case of medium large and large farms, the farmers used their farm machinery, such as tractors and hay balers, in doing custom work on their neighbors' farms in an effort to make a fuller use of such high-capacity machinery than their own farms would permit. It is significant to note that this practice of using farm equipment to do custom work was not widely followed on the extra large business units of 800 productive-man-work units, for example, because their scale of farming was large enough to utilize adequately the services of such equipment.

A comparison of farms of different sizes revealed that increases in size of business units were accompanied by tremendous decreases in the proportion of total work performed by the farmer and an increasing dependence on cropper labor. The farm work contributed by a typical farmer who had a small farm amounted to more than 60 percent of the total months of labor used in the operation of his farm, but on a typical extra-large farm the farmer performed less than 25 percent of the total. The importance of family labor changes little as the size of the farm increased. Of course, the tendency of the larger families to be found on the larger farms meant that the greatest amount of work was performed by family workers on the large farms. Cropper labor was not used at all on the very small farms, and the use of this labor was very limited on small, medium and medium-large farms. Farmers with large and extra-large businesses were depending to a very large extent on cropper labor, where these workers performed more than one-half of the total months of labor used on many of these farms. Some hired labor was necessary during peak labor seasons on most farms of all sizes, especially during cotton chopping and again during harvest.

The large businesses were so organ

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[16] Frequently referred to as "public" work.

ized that a more intensive use was made of land than was true of smaller business units, as evidenced by a direct relationship between the amount of productive work associated with each 100 acres of land and the size of business. Moreover, an increasingly greater portion of the tillable land on progressively larger business units was planted in cotton, which used relatively large amounts of labor per acre. Also, the number of productive animal units associated with each 100 acres, about which more will be said, was relatively higher on the larger farms. It becomes obvious, therefore, that progressively larger business units were not always the result of a progressively larger acreage in the farm or in crops. Some farms, relatively small in acreages were larger in terms of their farming operations than other farms having relatively larger acreages.

A greater labor efficiency was obtained on progressively larger farms. Each worker was not only accomplishing relatively more production work on the larger business units but was also working more acres of crops. Such labor efficiency was partly the result of using more and better-adapted machinery and equipment and spending a small proportion of time in doing the necessary hitching up horses or driving the tractor to the field, and partly the result of keeping more livestock to supplement and complement crops by furnishing year-round employment of family labor.

Large business units provided for more economical use of workstock and farm equipment. The number of crop acres per horse or mule averaged several times higher on large farms than on small farms. More equipment was associated with each acre of crops on the progressively larger business units. Small farms doubtless did not use their workstock and mule-drawn equipment to the full limits because the volume of business conducted on such farms was too small. As a result, these costs of producing each unit of farm product were higher than on the larger farms where fuller use was made of workstock and equipment. This cost situation was further reflected in the farm receipts obtained for each $100 of farm expenses. Small farms failed to achieve gross returns sufficient to cover farm expenses; that is, for each $100 of total farm expenses approximately $59 and $89 of farm receipts were obtained on very small and small business units, respectively.

The lowest crop yields occurred on the small farms, but the relationship was not consistent on the larger sized farms.

Commercial dairying was not highly important on very small farms but became increasingly more important, compared to cotton, on progressively larger business units until a medium-large business unit was reached. Beyond this point, the importance of dairying as a source of income diminished. Receipts from livestock and livestock products on small farms were mostly from the hog and poultry enterprises on the smaller farms. As the size of business increased, more of the farm receipts represented cattle sales.

There were significant differences in the stocking of farms with livestock and in the proportional numbers of the different classes of livestock kept on farms of different sizes, Table 22. The number of productive animal units associated with each 100 acres of land increased as size of farm increased, mainly in response to larger pasture area. When extra large farms were compared with very small farms, the pasture area per farm increased from 15 to 213 acres, accompanied by a decrease in the number of acres in pasture per animal unit of from 8.4 to 3.7. It followed, therefore, that small farms could have made a better use of the available pasture area, despite their small size. In the selection of livestock, particularly the heavy users

Table 22. Choice of livestock according to size of business, Northeast Mississippi, 1951.

Productive-man-work units	Number of farms	Productive animal units per 100 acres	Pasture area, acres	Pasture area per animal unit, acres	Percentage of animal units that were[1] Dairy cows	Other cattle	Hogs	Poultry
Less than 100 (very small)	7	4.9	15.2	8.4	60.9	11.7	16.0	11.4
100-199 (small)	27	6.0	31.3	8.2	62.5	17.9	9.6	10.0
200-399 (medium)	61	10.0	51.0	5.5	65.4	18.0	9.4	6.0
400-499 (medium large)	24	10.3	58.5	4.9	68.5	20.0	7.5	4.0
500-799 (large)	11	13.2	70.8	4.0	66.0	20.5	9.1	3.6
800 or more (extra large)	6	17.0	212.7	3.7	64.0	29.0	5.0	2.0

[1] Excludes a few sheep and goats on medium and large farms.

Table 23. Relation of size of business to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Size of business: Range	Average	Number of farms in group	Average farm income	Average labor income	Labor earnings: Range From	To	Average	Percentage of farms reporting $1,007 or more
Productive-man-work units:								
Under 100	71	7	—$132	—$236	—$354	$ 434	$ 171	......
100-199	147	27	— 84	— 265	— 993	1,950	470	15
200-399	293	61	441	113	— 764	2,590	1,013	46
400-499	423	24	494	136	— 603	2,924	1,106	54
500-799	613	11	1,181	500	— 482	3,482	1,887	81
800 or more	1,366	6	2,903	1,558	1,807	4,758	3,419	100
Acreage operated:								
Under 30	22	11	431	262	19	1,951	814	36
30-49	37	21	317	142	167	3,582	808	24
50-89	72	38	126	— 154	— 354	1,893	752	34
90-119	101	23	676	328	7	2,924	1,299	70
120-149	125	18	392	24	— 993	3,373	1,061	39
150-199	169	14	540	— 38	— 764	2,292	1,195	57
200 or more	293	11	1,785	792	— 402	4,758	2,125	64

of labor, it was observed that the proportion of the animal units that was dairy cows tended to increase as the size of farm increased until a medium-large business was achieved, but decreased when the farms increased beyond that point. The proportion that was cattle other than dairy cows increased, while the proportion that were hogs and poultry tended to decrease as the farms became larger. A few sheep and goats were raised on medium and large farms, although they are not very important as commercial enterprises on any farm.

Relation of size of business to earnings. The influence of size of business on earnings is shown in Table 23. Farmers who utilized relatively large amounts of productive-man-work were achieving earnings several times larger than those with a relatively smaller amount of productive work. For example, farmers operating extra large businesses of 800 or more man-work units were obtaining operator's labor earnings that averaged $3,248 higher than the operator's labor earnings obtained by farmers operating extra small businesses of less than 100 man-work units. No farmer conducting a very small business, involving under 100 man-work units, achieved operator's labor earnings as large as $500. Also, no farmer conducting a small-sized business unit of 100 to 199 man-work units obtained earnings as large as $2,000; only 15 percent of the small farms had earnings as large as $1,007. It was necessary for a farmer during the period of this study to operate a business exceeding approximately 500 man-work units in order to receive earnings as large as $3,000. Earnings exceeding $4,000 were limited to the extra large farms that averaged 1,366 man-work units. If the differences in several measures of farm returns, occurring among large farms on the one hand and relatively smaller farms on the other hand are carefully observed, it will be found that higher returns were associated with progressively larger business units, regardless of the measures of income used. Of course, the variations in farm returns among different sizes of farms were considerably wider in labor earnings than for any other measure of earnings. This indicates a relatively closer relationship between this measure of earnings and size of business than was true for other measures.

Although sufficient size of business was an advantage to successful farming, in many cases large farms failed to make satisfactory earnings because some other phases of their organization or operation were not efficiently developed. Many well-managed, medium-sized farms were better-paying businesses than the poorly-managed large-sized farms. Differences in earnings resulting from increases in the size of farm business under varying conditions of organization and operation is illustrated in the grouping of small, medium and large farms to permit comparisons in earnings among farms of varying size, but relatively homogeneous in such factors as livestock intensity, soil characteristics, labor efficiency, and commercial importance of dairying.

The advantage of operating a sufficiently large-sized business was considerably greater for farmers located in the Northeast Prairie and the Flatwoods than for those in the Northeast Highlands, as shown in Figure 8. Differences in operator's labor earnings achieved by farmers operating large-sized business units and those having small-sized business units were $2,431 for farmers located in the Northeast Prairie, $1,772 for farmers located in the Flatwoods, and only $1,171 for farmers in the Northeast Highlands. The observation that increases in earnings associated with size of business were smallest in the Northeast Highlands was partly the result of farmers in this soil area obtaining, on the average, lower labor efficiency and lower crop yields and partly the result

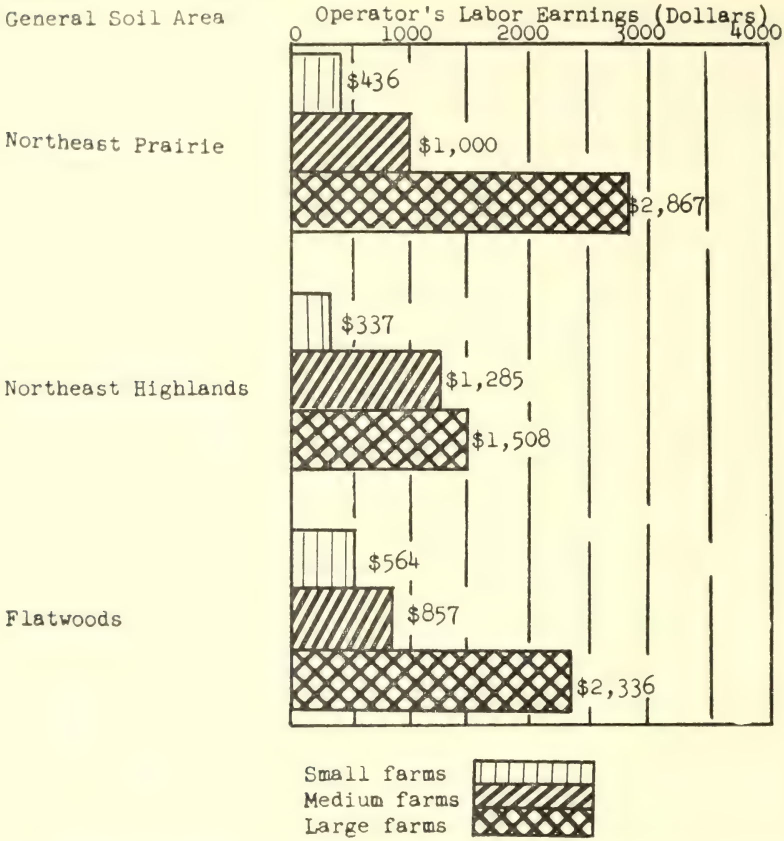

Figure 8. Operator's labor earnings of farms classified according to size of business and general soil area.

of operating farms with smaller capital investments.

When the farms within each size category were sub-divided into groups which were low, medium, and high in labor efficiency as is shown in Figure 9, it is observed that a sufficiently large-sized business paid better with all levels of labor efficiency. The extent of the advantage derived from a large-sized business, compared to one of a relatively smaller size, depended very largely on whether the comparison of earnings was made within a group of farms with low, medium, or high labor efficiency. For example, a comparison between medium and small farms, those with business units involving 200 to 400 man-work units compared to those under 200, revealed an increase in operator's labor earnings of $115 on farms with low labor efficiency, $539 on farms with moderate labor efficiency, and $670 on farms with high labor efficiency. A corresponding comparison between large-sized farms of 500 or more productive-man-work units and medium-sized farms of from 200 to 499 man-work units indicated increases in operator's labor earnings, associated with increases in the size of business, of $1,682 and $1,142 on farms having moderate and high labor efficiency, respectively. It should be noted that none of the farmers who achieved low labor efficiency were operating large-sized business units, and only 12 percent of the farmers who achieved high labor efficiency were operating small-sized business units.

The advantage of increases in size of business varied on farms of different degrees of livestock intensity, Figure 10. A change in size from small to medium operations was accompanied by average increases in operator's labor earnings of $567 on farms of low livestock intensity, $706 on farms of moderate livestock intensity, and $459 on farms of high livestock intensity. The increases in earnings resulting from a change from medium-sized to large sized business units were $1,739, $818, and $2,214 on farms of low, moderate, and high livestock intensity, respectively. Hence, a change from small to medium business units was most profitable on farms of moderate livestock intensity involving 9 to 16 animal units associated with each 100 acres, but a change from medium to large operations was most advantageous under conditions of heavy stocking of livestock. In general, the best-paying farms were those involving large businesses heavily stocked with livestock

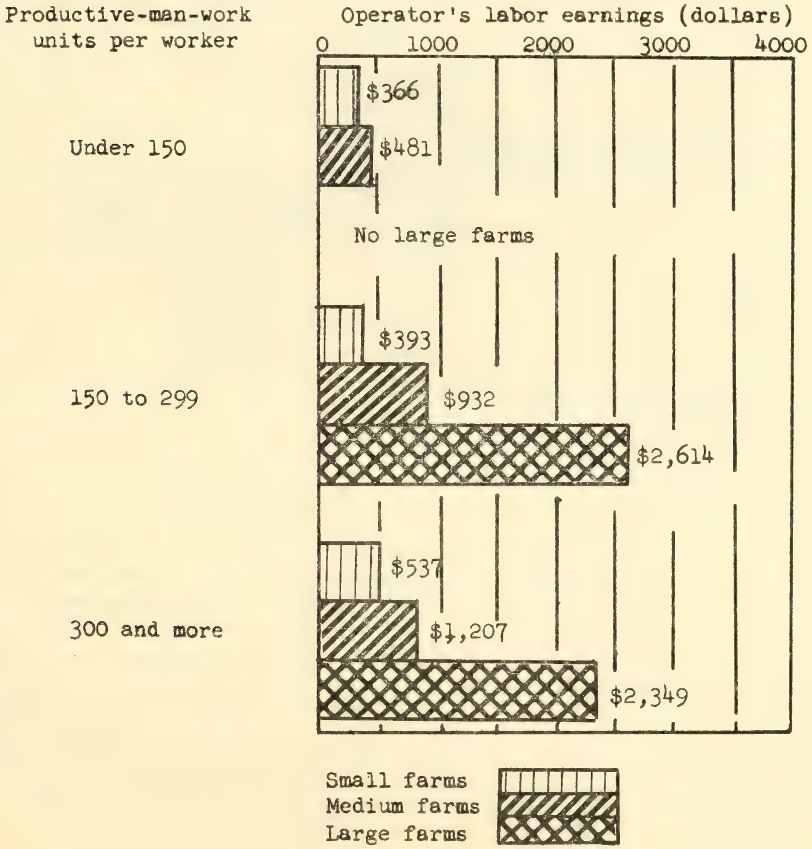

Figure 9. Operator's labor earnings of farms classified according to size of business and labor efficiency.

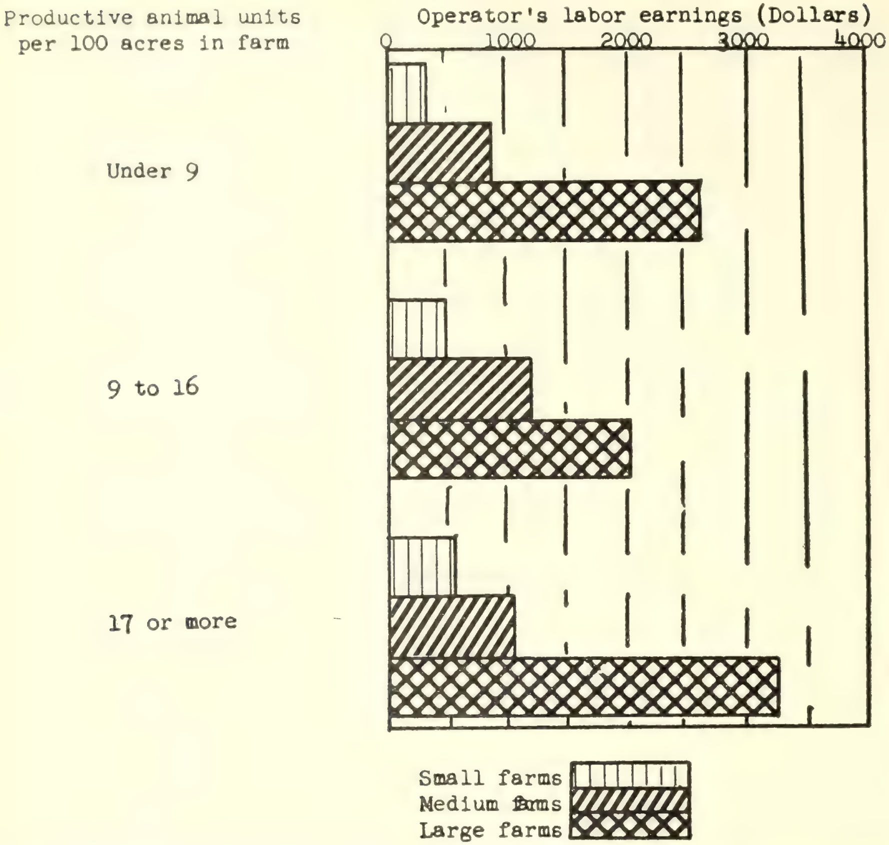

Figure 10. Operator's labor earnings on farms classified according to size of business and intensity of livestock.

while the poorest paying farms were those involving small business units lightly stocked with livestock.

Of importance also was the analysis of the commercial importance of the dairy enterprise. Data presented in Figure 11 indicates that it was not profitable to increase the size of farms beyond a medium-sized business unit, if 30 percent or more of the cash income was derived from the sale of milk and cream. To do so resulted in earnings almost as small as those obtained on the small businesses. Larger earnings resulted from a progressively larger business in almost every instance where the farmers received less than 30 percent of their cash receipts from the dairy enterprise. The most profitable farms were usually those involving large business units where a moderate proportion of income, somewhere between 20 and 30 percent, was derived from the sale of milk and cream. Large farms with a smaller proportion of cash income, under 20 percent, from dairying were also good-paying businesses. Favorable earnings were usually achieved under conditions of diversification where the dairy enterprise was included in the farm system to supplement and to complement crop production by furnishing year-round employment for family labor and consumption of forage crops. The reason it was not highly successful to specialize in dairying during the period of this study was due to the quality of dairy animal kept, poor feeding methods, low production per cow per year and during winter months, and low prices received for manufacturing milk compared to Grade A milk.

Farm Organization

The farmer, insofar as organization of his farm is concerned, has the responsibility of choosing the farm enterprises and combining them in such a manner as to utilize best his land, labor, and equipment. The farmer is said to have properly organized his farm, if he has been able to build up a combination of crop and livestock enterprises which (1) give a reasonably large volume of business; (2) distribute income widely enough throughout the year to meet current expenses and eliminate as much borrowing as possible; (3) use labor, workstock and equipment at different times and throughout much of the year; (4) maintain soil fertility; and (5) oc-

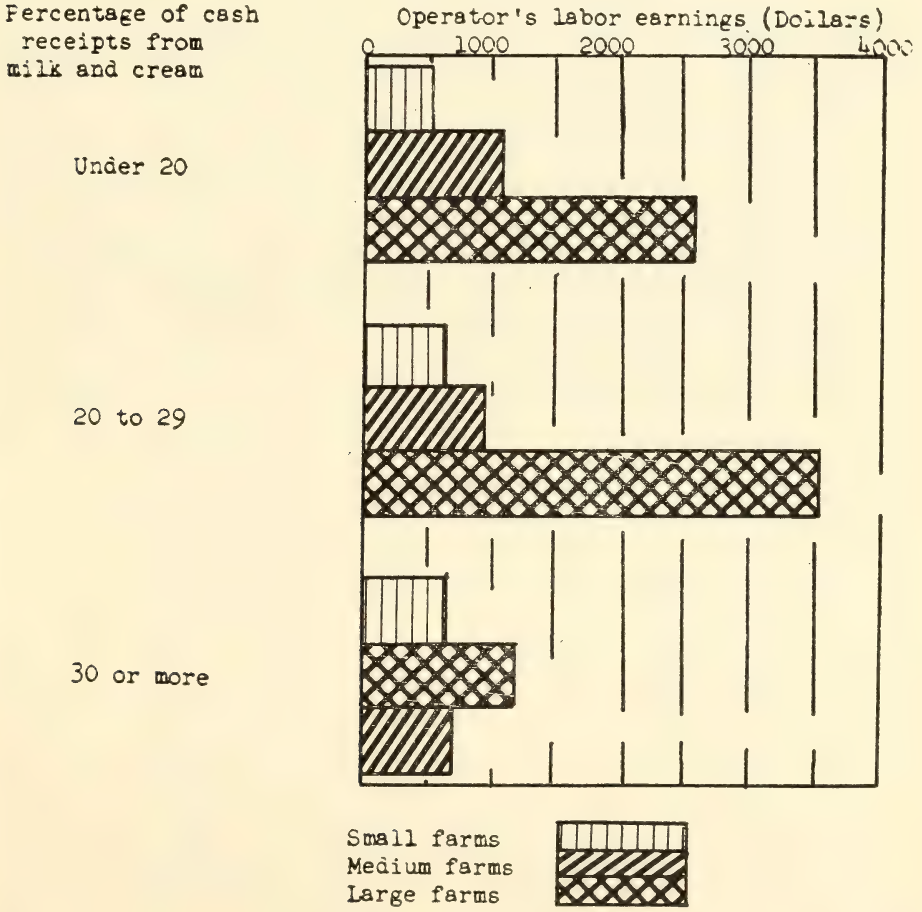

Figure 11. Operator's labor earnings on farms classified according to size of business and commercial importance of dairying.

Table 24. Relation of amount of labor per 100 acres in farm to farm organization, and operation Negro owner-operated farms, Northeast Mississippi, 1951.

Productive-man work units per 100 acres in farm	Number of farms in group	Acres in farm	Percetange of tillable land in cotton	Productive-man-work units	Percentage of productive-man-work units on			Percentage of cash receipts from	
					Crops	Livestock	Others[1]	Cotton	Milk
Under 150	8	124	3	155	46	46	8	25	35
150-199	15	148	7	262	56	33	10	44	13
200-299	25	106	11	268	52	35	10	50	14
300-399	36	122	13	417	52	38	9	53	15
400-499	24	90	14	392	46	43	11	47	22
500-999	21	62	21	411	44	38	18	45	14
1,000 or more	7	29	16	382	21	16	63	25	4

	Average farm capital	Productive animal units per 100 acres in farm	Productive-man-work units		Acres in crops per work animal	Productive-man-work units per worker	Equipment per acre in crops	Crop yield index	Farm receipts per tillable acre
			On crops per 100 acres in crops	Per $1,000 of capital					
Under 150	$6,023	4	450	26	7	173	$25	108	$14
150-199	6,306	5	592	42	8	262	20	77	12
200-299	5,859	8	532	46	8	244	19	106	21
300-399	9,464	11	608	44	9	278	24	98	32
400-499	8,495	15	520	46	10	302	26	96	36
500-999	6,366	23	607	64	9	342	21	89	46
1,000 or more	4,066	18	571	94	6	546	27	83	95

[1] Largely labor off the farm by farmers including the use of their machinery and equipment in doing custom work for their neighbors as well as non-farm work requiring the use of their trucks.

cupy land on various levels of productivity. The farmers of this area will naturally differ widely in their judgments as to the kinds and proportionate combinations of enterprises which give promise of the most favorable earnings. There is definitely no one combination of enterprises which will be best adapted to all individual farms within this area; however, there is a combination best-suited to every farm if each individual farmer will put forth effort to work out such organization for his particular farm.

Intensity of Farm Operation. It was pointed out earlier that many farmers enlarged their businesses by greater intensity in the use of land. The extent of variation in intensity of operations occurred not only on farms of different acreages but was observed among farms of similar acreages. Thus, it was felt that a greater intensity in the use of land by combining more labor with each 100 acres would have an important bearing on the level of earnings on farms, regardless of their acreage in operation.

The variation from farm to farm in the amount of productive labor utilized to each 100 acres in the farm was from 90 to 1,768 work units. An average of 342 productive-man-work units was utilized per 100 acres. Most of the farms, 79 percent, ranged between 100 and 500 work units. The most highly intensified farms, those with at lease 1,000 productive-man-work units per 100 acres, included only 5 percent of the farms.

Relation of productive days' work per 100 acres of farm land to organization of operation. Generally, farms with relatively small acreages utilized the largest amount of productive labor per 100 acres of farm land. The small acreage was in turn associated with a relatively high proportion of the tillable land in cotton and also a large amount of productive livestock per 100 acres of land. Because of a relatively large amount of off-farm work, the increased importance of cotton, or the relatively heavier stocking of livestock, a large volume of business was conducted on the small acreage, Table 24. Whereas 7 farms of at least 1,000 units of productive work per 100 acres averaged 382 total work units on 29 acres, 8 farms of fewer than 150 units of productive labor per 100 acres had an average of only 155 total productive-man-work units on 124 acres. The importance of dairying as a source of income, compared with cotton, declined as the farms utilized more labor per 100 acres. Milk and cream sales comprised 35 percent of the total cash reseipts on farms with the least amount of productive work per 100 acres but only 4 percent of the cash receipts on the farms with the highest amount of productive labor combined with land.

The efficiency with which labor was utilized was directly related to the intensity of operation. Such labor efficiency was possible on the farms using a large amount of productive work in relation to land because of the better balance between crops and livestock in the farming systems and the use of off-farm work to utilize the farmers' spare time. As the amount of productive labor used to each 100 acres of land increased, the crop acreage became more adjusted with respect to the workstock available, until a maximum level of about 436 work units per 100 acres was reached; beyond this point the balance between the crop acreage and workstock tended to be increasingly more unfavorable. The level of crop yields was not consistently associated with the amount of productive labor used in proportion to land. There was a slight tendency, however, for the level of crop yields to be somewhat lower on farms using the most labor per 100 acres of land. Receipts per tillable acre increased, on the average, about seven fold as the farms studied increased in amount of labor being used to each 100 acres. Such an increase, with

Table 25. Relation of amount of labor per 100 acres in farm to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive-man-work units per 100 acres in farm		Number of farms in group	Average farm income	Average labor income	Percent earned on capital	Operator's labor earnings			
						Range			
Range	Average					From	To	Average	Percentage of farms reporting $1,007 or more
149 or less	126	8	$ 145	—$ 156	— 6.2	—$993	$2,094	$ 587	25
150-199	177	15	— 188	— 504	—12.6	— 764	1,120	438	7
200-299	253	25	371	78	— 5.8	— 177	4,145	947	40
300-399	342	36	693	220	— 1.4	— 603	4,488	1,246	61
400-499	436	24	495	70	— 4.4	7	4,758	1,033	33
500-999	663	21	611	292	— 0.4	— 148	3,373	1,267	52
1,000 or more	1,317	7	1,242	1,038	17.8	1,003	3,482	1,765	86

its resulting wide margin between receipts and expenses, made possible larger farm earnings even on considerably smaller acreages.

Relation of productive days' work per 100 acres of farm land to earnings. Farmers who obtained relatively high earnings were generally those who had a greater intensity in the use of land, Table 25. In some instances, a progressively higher intensity of operation did not result in more favorable earnings. These inconsistancies in the relationship between the intensity of operation and earnings suggest the possibility that other important factors in the organization and operation of a farm may obscure or outweigh relations that would otherwise exist among the farms. Thus, a farmer may expect to better his chances of obtaining favorable earnings through the process of combining more productive man labor with land, provided he operates the farm at a favorable level of over-all efficiency. Farms highest in intensity of operation produced operator's labor earnings that averaged $1,765, whereas the farms lowest in that respect produced operator's labor earnings of $587. Increases in other measures of farm returns were associated with a greater intensity of operation, although the increases were not always consistent. The most noticeable increase of these measures occurred in the rate of return to capital. Approximately 18 percent was earned on the farm investment under conditions where a rate of at least 1,000 productive-man-work units were combined with each 100 acres of land. At lower rates the farmers failed to realize any return for the use of their capital in the farm business.

Intensity of Livestock Production. The farms studied did not differ in the classes of livestock as much as they did in the amount of livestock kept in proportion to the acreages operated. The number of productive animal units kept per

100 acres of farm land is used here to measure the intensity of livestock production other than workstock. An average of 11.2 animal units of livestock that added to the income in some way was kept on the farms studied. When classified according to livestock intensity, considerable variation occurred from farm to farm. The range extended from 1 unit on each of three farms to 60 units on one farm. About two-thirds of the farms maintained somewhere between 2 and 12 animal units to each 100 acres of farm land. A narrower range of from 5 to 12 units included half of the farms. Only 2 percent of the farms had as many as 46 animal units per 100 acres in the farm.

Relation of productive animal units per 100 acres of farm land to organization and operation of farms. The organization and operation of farms of varying degrees of livestock intensity are shown in Table 26. The most intensified livestock-producing farms were generally on small acreages, and had a relatively high proportion of the farm land in pasture. Despite the relatively smaller acreage, the farms which are more heavily stocked with livestock had a large-sized business, when measured in terms of the units of productive labor utilized during the year. A large portion of this labor was utilized on the livestock enterprise, compared to crops and other productive endeavors, on these heavily stocked farms. Whereas about 56 percent of the productive labor was used on livestock on farms of high livestock intensity, only 20 percent was so used on lightly-stocked farms. The proportion of the cropland in cotton did not vary significantly among the farms with varying degrees of livestock intensity.

A difference in the amount of livestock kept to each 100 acres was not consistently related with crop yields. Low crop yields were produced on farms of low and of high livestock intensity; farms of medium intensity had the highest yields. Farm equipment investment increased as the amount of livestock per 100 acres increased.

Dairy cattle was the most important class of productive livestock on all farms regardless of their intensity. Commercial dairying was not highly important on farms of low livestock intensity, but became increasingly more important, compared to cotton, on farms with a progressively higher livestock intensity. The sale of milk and cream represented only 8 percent of the cash income on farms of less than 5 animal units to each 100 acres of land, as compared with 24 percent on farms with 21 or more units. Livestock production, represented mostly by the sale of dairy steers and calves supplementing the sale of a few beef-type cows, became increasingly more important on the more heavily stocked farms. Farms that were most intensified in terms of productive livestock maintained almost as many units of other cattle as they did dairy cows, Table 27. Sheep and goats were on farms having few animal units per farm and per 100 acres of farm land.

As the farms increased in livestock intensity, the receipts per tillable acre in the farm almost trebled while expenses per acre did not increase nearly as much. This widening of the margin between expenses and receipts per tillable acre did not always reflect itself in larger earnings because of the differences in acreages in farms.

Relation of productive animal units per 100 acres of farm land to earnings. The effect on earnings of differences in the stocking of farms with productive livestock is shown in Table 28. The farmers with the highest amount of livestock combined per 100 acres of land obtained average operator's labor earnings of $1,589. In contrast, farmers with the lowest amount of livestock per 100 acres obtained similar earnings of only $473. The difference in operator's labor income between the group of farms that

Table 26. Relation of livestock intensity to farm organization and operation Negro owner-operated farms, Northeast Mississippi, 1951.

Productive animal units per 100 acres in farm	Number of farms in group	Productive animal units per farm	Acres in farm	Acres in pasture	Acres in pasture per animal unit	Productive-man-work units per farm	Percent of productive-man-work units on livestock	Productive-man-work units on livestock per animal unit
Less than 5	24	3.6	106	52	14.4	222	20	12
5-8	40	8.0	119	69	8.6	333	30	12
9-12	29	11.4	103	54	4.7	406	36	13
13-16	19	12.7	84	45	3.5	375	41	12
17-20	9	13.4	72	37	2.8	325	56	14
21 or more	15	27.1	79	50	1.8	478	56	10

	Productive-man-work units per 100 acres in farm	Percent of cropland in cotton	Percentage of cash recepits from dairying	Crop yield index	Acres in crops per work animal	Machinery and equipment per acre in crops	Receipts per tillable acre	Expenses per tillable acre
Less than 5	209	27	8	64	7.4	$18	$18	$19
5-8	288	29	15	92	8.0	19	20	16
9-12	394	38	16	103	9.5	25	36	26
13-16	446	29	20	127	8.4	32	40	32
17-20	451	27	27	119	8.4	25	45	38
21 or more	605	25	24	84	8.4	24	45	28

Table 27. Relation of livestock intensity to kinds of livestock, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive animal units per 100 acres in farm	Number of farms in group	Productive animal units per 100 acres in farm	Percentage of productive animal units that were				
			Dairy cows	Cattle	Hogs	Poultry	Sheep and goats[1]
Less than 5	24	3	68	11	11	9	1
5-8	40	7	67	17	8	6	2
9-12	29	11	68	21	7	4	----
13-16	19	15	67	21	9	4	----
17-20	9	19	69	19	9	4	----
21 or more	15	34	50	42	6	2	----

[1] Reported on five farms.

Table 28. Relation of productive animal units per 100 acres in farm to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive animal units per 100 acres		Number of farms in group	Average farm income	Average labor income	Total labor returns per man—equivalent worker	Labor earnings			
						Range			
Range	Average					From	To	Average	Percent of farms reporting $1,007 or more
Less than 5	3	24	—$ 30	—$286	$ 884	—$993	$4,145	$ 473	12
5-8	7	40	313	9	1,436	— 402	2,924	995	42
9-12	11	29	805	358	1,242	— 603	4,488	1,261	55
13-16	15	19	597	180	1,331	— 482	2,590	1,243	58
17-20	19	9	373	— 22	1,321	— 207	1,893	919	56
21 or more	34	15	1,075	607	1,810	— 148	4,758	1,589	67

averaged 3 units of productive livestoc' per 100 acres and the group that kept an average of 34 units per 100 acres was $893. The corresponding difference for the average farm income was $1,105. The increase in the total labor returns per man-equivalent associated with heavier stocking of livestock on farms was not highly consistent, yet the returns were considerably larger on the highly intensified farms than on the farms of lowest intensity. The chance of a farmer, within the limits of this study, achieving labor earnings as great as $1,007 or more improved progressively with increasingly heavier stocking of livestock. Sixty-seven percent of the farmers who maintained 21 units or more of productive livestock per 100 acres of land achieved labor earnings of $1,007 or greater, while only 12 percent of the farmers with fewer than 5 units of livestock per 100 acres had labor earnings that large.

The effect of differences in livestock intensity on earnings on farms with about the same levels of crop yields is shown in Table 29. Increases in earnings resulted from heavier stocking of farms with livestock with or without corresponding increases in crop yields. However, they were smaller on the farms with low yields than on farms with average or above crop yields. Differences in operator's labor earnings between farms keeping under 9 units of productive livestock per 100 acres and those keeping 17 units or more per 100 acres was only $238 on the farms with low yields, or those with a crop yield index of 79 or less. Within the other two farm-groups, those with crop yield indexes falling between 80 and 119, and 120 or more, the comparable differences in labor earnings for the lowest-intensity and the highest-intensity farms were $834 and $326. Where farms are heavily stocked with livestock, either high yields of grain and forage crops must be obtained or a large proportion of the feed must be purchased. Under ordinary conditions, feed can be grown more cheaply on the farm than it can be bought. This has been especially true during recent years due to the high price situation brought on by World War II and the Korean Conflict.

Commercial Importance of Dairying. Dairying was the second most important enterprise on most farms, although none of these farmers sold to a Grade A market. An average of 17 percent of the cash receipts on farms studied was derived from the sale of milk or cream. On one-third of the farms no milk was sold, while one in every eight received 45 percent or more of their cash receipts from the sale of dairy products. Forty-five percent of the farms received less than 30 percent of their cash receipts from the dairy enterprise.

Relation of proportion of cash receipts derived from dairying to farm organization and operation of farms. The organization and operation of farms differing in the commercial importance of dairying is given in Table 30. Farmers with relatively small business units were generally those on which no milk and cream were sold, and also those on which an attempt was made to specialize in dairying. The typical size of business of the two groups was about 75 acres, involving approximately 230 productive-man-work units. The businesses having high sales of dairy products were generally operated by farmers who used dairying as an important subsidiary enterprise to the production of cotton. On many of the large farms the dairy enterprise was of lesser importance because of the relatively large amount of emphasis being placed on livestock production particularly cattle raising.

Differences in the commercial importance of dairying affected the organization of farms. This was especially true in the distribution of the productive work furnished by crops, livestock and other sources of productive labor. The pro-

Table 29. Relation of livestock intensity to labor earnings with three levels of crop yields, Negro owner-operated farms, Northeast Mississippi, 1951.

Crop yield index	Productive animal units per 100 acres in the farm	Number of farms in group	Average labor earnings
79 or less	8 or less	39	$ 633
	9-16	12	943
	17 or more	10	871
80-119	8 or less	14	831
	9-16	18	1,382
	17 or more	6	1,665
120 or more	8 or less	11	1,350
	9-16	18	1,333
	17 or more	8	1,676

portion of the productive work derived from sources other than crops and livestock production decreased in about the same proportion that dairying was increased as a source of income. Almost one-third of the productive work expended in the farm business where no milk or cream was sold, represented work from sources other than farm enterprises, most of which was non-farm labor. More of the productive work was utilized on the livestock herds than on crops where 20 percent or more of the cash income was received from dairy products.

Relatively low crop yields were obtained on farms where no milk was sold and also on the farms that derived 45 percent or more of the cash receipts from the dairy enterprise. For farms placing moderate emphasis on dairying, crop yields bore a direct relationship to the importance of milk and cream sales. By placing moderate emphasis on dairying, along with the production of cotton, the farmers were achieving more efficient use of their labor. To overemphasize dairying, however, resulted in a relatively low labor efficiency. The same was true on farms where cotton was the only cash crop. The two enterprises, cotton and dairying, supplement and complement each other in the use of labor, particularly family labor.

Relation of proportion of cash receipts derived from dairying to earnings. Since dairying was one of the three main lines of agricultural production in this area, it is logical to assume that variations in earnings would be influenced to some extent by the relative importance of the dairy enterprise on individual farms. The effect on earnings of differences in the proportion of cash receipts derived from the sale of milk and cream is presented in Table 31. Earnings increased as dairying became relatively more important, up to about 14 percent of the receipts. Beyond this further increase in emphasis on the dairy enterprise resulted in lower earnings. Under the most favorable conditions for dairying, 40 to 50 percent of the cash income came from the cotton enterprise.

Farm Operation

The last function of the farmer's problem of getting favorable earnings deals with the efficiency with which the farm is operated, which in turn is a reflection of the use of the technical farm practices in the production of crops and livestock, and the manner in which the farm business is handled.

Crop Yields. The four general soil areas located in Northeast Mississippi vary in fertility, adaptation and method of management. Within each of these soil areas are found differences in natural fertility that may handicap some farmers more than their neighbors even in the same community. Also, rainfall is bound to influence to considerable extent the crop yields obtained.

Table 30. Relation of proportion of income from milk to farm organization and operation, Negro owner-operated farms, Northeast Mississippi, 1951.

Pecentage of cash from milk	Number of farms in group	Productive animal units per 100 acres in farm	Land in farms, acres	Percentage of tillable land in cotton	Productive-man-work units	Percentage of productive-man-work units on		
						Crops	Livestock	Others[1]
None from dairying	44	4	75	12	227	48	21	31
9 or less	18	10	143	19	571	55	32	14
10-19	21	13	128	13	430	53	39	14
20-29	23	13	107	10	366	44	49	7
30-44	19	13	110	10	367	45	48	7
45 or more	11	7	75	10	231	43	52	5

	Percentage of cash receipts from		Acres in crops per worker	Acres in crops per work animal	Equipment per tillable acre	Productive-man-work units per worker	Crop yield index	Farm receipts per tillable acre
	Cotton	Milk						
None from dairying	42	----	20	4	$22	227	78	$20
9 or less	63	6	24	10	23	300	100	40
10-19	46	14	30	12	24	307	103	31
20-29	42	25	24	9	23	305	109	30
30-44	36	35	26	11	21	306	112	30
45 or more	34	49	20	7	27	231	82	22

[1] Largely labor off the farm by farmers including the use of their machinery and equipment in doing custom work for their neighbors as well as nonfarm work requiring the use of their trucks.

Some important causes of variations in yields of crops in the area will of course come within the control of the farmers. Experiments have shown the kind and amount of fertilizer needed on various crops in the area, the manner in which crops should be cultivated, the care and selection of seeds, the methods of controlling diseases and insects, and so on. It is the task of the farmer to see that the factors needed for growth are supplied in the best available combination, cost considered, and that the detriments to good yields are kept at the minimum practicable level. The extent to which the average farmer in this area does these things in his capacity as manager will have a definite bearing on his earnings.

In studying the effects of crop yields on earnings, organization and operation, the relative differences in the levels are important as well as the absolute yields of individual crops. The yields of the different crops have been expressed as an index, referred to in the subsequent analysis as the "crop yield index," which is a measure of comparison of crop yields on a particular farm with the average yields of all farms included in the study.[17]

It should be remembered, when observing yields for the particular crop year under study, that weather conditions were unfavorable. Although a wet year, droughts occurring in the area during May, June, July, August, and part of the Fall, had an adverse effect on the production of grain, forage and pasture crops, and an even greater detrimental effect on cotton.

The range in the crop yield index was from 1 to 312. A large majority of the farms, 78 percent, had crop yield indexes falling somewhere between 40 and 159. One-fifth of the farms had crop yields that were more than 50 percent below the average, while 12 percent of the farms had yields that were more than 50 percent above the average.

Relation of crop yield index to farm organization and operation. The farms with high yields tended to be larger both in acres in the farms and in volume of business as measured by the amount of productive labor utilized, Table 32. Farmers on large farms were getting good crop yields because they probably had a higher proportion of the more productive soils, devoted more time to the soil improvement programs advocated by the local technicians of the Soil Conservation Service and the extension agent, and followed more closely improved methods of growing crops. Where farmers poisoned cotton to control or combat boll weevil infestation, used good quality and disease-free strains of seeds, carefully timed the planting dates, controlled soil erosion, and used limestone and fertilizer in recommended amounts, they generally obtained better than average yields. Farmers obtaining relative high yields used $1.22 more fertilizer to each acre of crop, or commercial fertilizer costing $3.33 per crop acre compared with $2.11 per acre on farms with low yields. More capital was usually found on the farms where relative high yields were obtained than on those with relative low yields. On some of these farms, the increased capital reflected a larger amount of equipment per acre in crops, while for others it indicated a higher value of land per acre due to higher productivity.

The higher yields of corn and hay crops permitted heavier stocking with livestock, but many farmers failed to take advantage of the increased feed produced. Thus, the amount of productive livestock kept to each 100 acres of land did not increase consistently with the level of yields, and there was little or no association between crop yields and the livestock intensity in the use of land.

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[17] The method used in determining the crop yield index for a given farm is described in the Appendix.

Table 31. Relation of proportion of cash receipts from dairying to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Percentage of cash receipts for milk sale		Number of farms in group	Average farm income	Average labor income	Total returns to labor per worker	Labor earnings			
						Range			
Range	Average					From	To	Average	Percentage of farms reporting $1,007 or more
None	----	44	$ 92	—$121	$1,1116	—$993	$1,951	$ 717	23
9 or less	6	18	744	179	1,437	— 764	4,488	1,305	56
10-19	14	21	925	428	1,569	— 177	4,145	1,525	62
20-29	25	23	591	175	1,442	— 148	4,758	1,141	65
30-44	35	19	691	506	1,471	— 402	2,542	1,235	47
45 or more	49	11	217	— 93	924	— 482	1,950	618	27

Table 32. Relation of crop yield index to farm organization and operation, Negro owner-operated farms, Northeast Mississippi, 1951.

Crop yield index	Number of farms in group	Productive-man-work units	Acres in farm	Acres in cropland tilled	Percentage of crop-land in cotton	Productive-man-work units per 100 acres	Productive-animal units per 100 acres	Man-equivalent workers
Less than 40	15	253	88	18	33	288	6	1.0
40-59	22	285	72	23	30	396	12	0.9
60-79	24	287	104	29	28	276	8	1.1
80-119	38	450	119	40	32	378	13	1.5
120-159	22	348	103	27	30	338	11	1.3
160 or more	15	367	114	33	24	321	12	1.2

	Average farm capital	Percentage of cash receipts from dairying	Acres in crop per work animal	Productive-man-work units per worker	Fertilizer cost per acre of crops	Equipment per acre of crops	Farm receipts per tillable acre	Farm expense per tillable acre
Less than 40	$ 4,735	7	8	253	$2.11	$26	$21	$19
40-59	4,497	22	7	317	2.09	18	26	24
60-79	5,777	16	10	261	2.31	18	20	17
80-119	9,156	12	8	300	2.35	25	32	25
120-159	8,064	21	9	268	2.89	22	33	24
160 or more	10,823	18	10	306	3.33	29	38	23

There was no consistent relation between differences in crop yields and the amount of work accomplished per worker or the acres in crops per work animal. As the yields increased receipts and expenses per tillable acre increased. Receipts, however, increased much faster than expenses, thereby producing a progressively larger margin between the receipts and costs per tillable acre.

Relation of crop yield index to earnings. Table 33 indicates that crop yields influence greatly relative farm earnings. In almost every instance, progressively higher crop yields resulted in progressively higher comparative earnings. Farmers who obtained an average crop yield index of 206 had operator's labor earnings that averaged $1,011 higher than those obtained by farmers whose crop yield index averaged 29. The chance of a farmer's making a labor earnings of $1,007, with a crop yield index of 160 or above was 4 in 5, compared with 4 out of 15 for a farmer whose crop yield index was under 40.

Differences in yields were associated with variations in sizes of business, Table 34. Increasingly greater ranges in operator's labor earnings occurred on progressively larger farms, until a medium scale of operation was reached. On the large farms, higher yields of grain and forage crops were not consistently associated with high cotton yields, and higher-than-average yields of cotton were especially advantageous to high earnings, since this crop was the major source of income on most farms.

The increases in earnings resulting from differences in crop yields were considerably greater on Negro farms located in the Northeast Prairie and the Flatwoods than those in the Northeast Highlands, Table 35. Differences in operator's labor earnings between farms having a crop yield index of less than 80 and those with an index of 120 and over were $1,075 on the farms located in the Northeast Prairie, $697 on the farms located in the Flatwoods, and only $249 on the farms located in the Northeast Highlands.

Labor Efficiency. Labor expense was the largest item of farm expenses, and in recent years, has become an increasingly larger part of the total farm expenses. The total labor expense, as used in this analysis, included the value of hired, cropper and unpaid family labor but excluded the operator's labor. It represented 37 percent of the total expenses of operating the farm business. It follows that the lower the labor expense as a result of efficient utilization of labor, the greater are the chances for higher farm earnings.

Labor efficiency as used in the subsequent analysis refers to the amount of productive work accomplished per worker on the farm.[18] When a large amount of productive work was achieved per worker, the labor expense per unit was reduced and any reduction in expense for this item resulted in a substantial decrease in the total cost of production per unit or per acre. Efficiency in the use of farm labor was especially important during 1951 due to the scarcity and high cost of labor set off by the Korean conflict in 1950. War efforts always expand the importance of labor efficiency on the farm because of the draft and the migration of people from farms to cities.

There was a wide variation in the quality and amount of work done on different farms in this area. An average of 288 productive-man-work units (10-hour days of work) was performed per worker. Somewhere between 130 and 299 units (days) of productive labor were achieved per worker on one-half of the farms. About one-tenth of the farmers had labor efficiency that was more than 50 percent above the average, while one-fifth of the farmers had labor efficiency that was more than 50 percent below the average.

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[18] The method used in computing productive-man-work units per worker for a given farm is described in the Appendix.

Relation of productive days' work per worker to farm organization and operation. The association between differences in labor efficiency, measured by the productive work accomplished per man-equivalent worker, and the organization and operation of farms is indicated in Table 36. High labor efficiency was associated with a large-sized farm, both in acreage and in amount of productive labor utilized. The relatively high labor efficiency on the large farms was due to several conditions, such as a volume of business large enough to keep the labor force employed throughout most of the year, and economy in the use of improved machinery and equipment. The farms most efficient in the use of labor received a much smaller proportion of the cash income from cotton and higher proportions from the sale of milk and cream. The livestock enterprises were more important on the farms on which the most efficient use of labor was obtained. The stocking with livestock was approximately 6 units per 100 acres on farms with the least efficient use of labor. In constrast, there was an average of 12 units per 100 acres on farms obtaining the most efficient use of labor.

Efficiency in the use of labor was affected significantly by the distribution of the work between crops and livestock. Farms with the highest labor efficiency, compared with those with the lowest labor efficiency, used a lower proportion of the labor on crops, 41 compared to 63 percent, and a higher proportion on livestock, 38 compared to 25 percent. The farms lowest in labor efficiency and those highest in that respect obtained a higher proportion of their productive work from productive endeavors other than crops and livestock, than did the farms of medium labor efficiency. Such productive labor consisted largely of

Table 33. Relation of crop yield index to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Crop yield index		Number of farms studied	Average farm income	Average labor income	Total labor returns per worker	Labor earnings			
						Range			Percentage of farms reporting $1,007 or more
Range	Average					From	To	Average	
Less than 40	29	15	$ 108	—$129	$1,066	—$354	$2,293	$ 643	27
40-59	50	22	120	— 105	1,153	— 764	2,924	639	23
60-79	68	24	226	— 63	1,327	— 177	4,145	878	38
80-119	97	38	672	215	1,393	— 603	4,758	1,224	45
120-159	136	22	590	187	1,422	— 903	2,486	1,233	49
160 or more	206	15	1,182	642	1,822	— 634	3,393	1,654	80

work off the farms by the farmers for pay, including the use of their farm machinery and equipment in doing custom work for their neighbors as well as non-farm work requiring the use of their trucks. Since the farms with low efficiency were small in size, it is possible that the farmers operating this size of businesses were attempting to utilize some of their spare time by working off the farm mostly in nonfarm work. The farmers with high labor efficiency, operating larger farms, used their equipment such as tractors and hay balers in doing custom work for their neighbors. The farmers who obtained the most efficient use of their labor force also worked 21 acres more of crops per worker than those performing the least amount of work. The efficiency obtained in the use of labor had little, if any, affect on crop yields and the adjustment of crop acres to workstock.

Relation of productive days' work to earnings. Earnings on farms grouped according to the number of productive-man-work units per worker, are shown in Table 37. Farmers who obtained efficient utilization of their labor force also obtained relatively high earnings. Those farmers achieving 300 or more units of productive labor per worker obtained operator's labor earnings that averaged $979 higher than the earnings made by farmers who accomplished fewer than 150 units of productive labor per worker. Only 12 percent of the farms with low labor efficiency had operator's labor earnings of $1,007 or more, compared with 56 percent on farms that were high in labor efficiency. Each additional unit of productive labor performed per worker was responsible for an average increase of $2.71 in operator's labor earnings, $2.29 in operator's labor income, and an average of $2.85 in farm income. An average increase of $3.22 in the returns to labor per worker

Table 34. Operator's labor earnings on farms differing in crop yields and size of business, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive-man-work units	Crop yield index	Number of farms	Labor earnings per farm
Under 200	Under 80	21	$ 262
	80-119	8	600
	120 or more	5	652
200-499	Under 80	37	827
	80-119	19	830
	120 or more	19	1,440
500 or more	Under 80	3	2,748
	80-119	11	2,356
	120 or more	3	2,362

Table 35. Operator's labor earnings on farms differing in crop yields and soil areas, Negro owner-operated farms, Northeast Mississippi, 1951.

Major soil area	Crop yield index	Number of farms	Labor earnings per farm
Northeast Prairie	Under 80	14	$ 639
	80-119	15	1,127
	120 or more	13	1,714
Northeast Highlands	Under 80	13	907
	80-119	10	1,158
	120 or more	15	1,156
Flatwoods	Under 80	34	707
	80-119	13	1,384
	120 or more	9	1,404

Table 36. Relation of labor efficiency to farm organization, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive-man work-units per man-equivalent worker	Number of farms in group	Acres in farm	Percentage of tillable land in cotton	Productive-man-work units	Percentage of productive-man-work units on: Crops	Livestock	Others[1]	Average farm capital
Under 150	17	61	12	142	63	25	12	$3,897
150-299	62	103	14	340	55	38	7	7,734
300 or more	57	114	10	423	41	38	21	7,904

	Productive-animal units per 100 acres in farm	Percentage of cash receipts from: Cotton	Milk	Productive-man-work units per worker	Acres in crops per worker	Acres in crops per work animal	Equipment per crop acre	Crop yield index
Under 150	6	59	14	109	12	6	$21	72
150-299	10	59	14	227	22	9	21	105
300 or more	12	34	18	470	33	8	28	89

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[1] Largely labor off the farm by farmers including the use of their machinery and equipment in doing custom work for their neighbors as well as non-farm work requiring the use of their trucks.

Table 37. Relation of labor efficiency to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Productive-man-work units per worker		Number of farms in group	Average farm income	Average labor income	Total returns per worker	Labor earnings			
						Range			Percentage of farms reporting $1,007 or more
Range	Average					From	To	Average	
Under 150	109	17	—$218	—$413	$ 648	—$993	$1,391	$ 386	12
150-299	227	62	378	— 8	1,179	— 764	4,488	955	42
300 or more	470	57	811	416	1,810	— 482	4,758	1,365	56

was achieved as a result of each additional unit of productive labor performed per worker.

Efficiency in the Use of Farm Machinery and Equipment. High labor efficiency was accomplished largely by having an adequate size of business and by using well-established machinery and equipment adapted to the work requirements of the individual farm. Farm machinery and equipment must be operated on an efficient basis if economies in labor are to be reflected in higher earnings. It is the duty of the farmer, in his effort to achieve high efficiency and low unit cost, to use the best-adapted equipment at or near full capacity during the year. Also, this equipment must be properly cared for and adequately stored in order to reduce maintenance and depreciation costs.

The investment in farm machinery and equipment per acre in crops is used here as an indication of the adjustment of crop acreage to machinery and equipment available. As such it reflects the efficiency of farmers in the use of their machinery and equipment. Farms with a relatively small amount of equipment per acre of crops were primarily those with one-mule half-row equipment. Farms with a large amount of equipment were largely those with farm machinery and equipment of higher capacity, such as tractors and attachments, farm trucks and well-established mule-drawn equipment.

The variation in the investment in machinery and equipment per acre in crops was from $0.40 to $78, with an average for all farms of $23. A range from $5 to $30 included 80 percent of the farms with the usual investment between $10 and $15. Approximately 18 percent of the farms had $30 or more of equipment and machinery available per acre of crops.

Relation of farm machinery and equipment per acre of crops to organization and operation of farms. The investment in farm machinery and equipment was closely related to size of farm, Table 38. About 15 percent of the farmers, mostly those operating the larger farms, owned tractors. The full use, or nearly so, of machinery, which is so essential to efficiency and low unit costs, was possible only on a large farm with its large volume of business. Many farmers had power equipment on farms where the acreage in crops was not ample for capacity use of their machinery, but in most cases these farmers did custom work. These farmers had between $30 and $40 invested in equipment per acre in crops. Most of the farms with the largest investment in equipment, those with $50 or more of equipment available per acre of crops, were not large enough in acres in cotton and in other crops to make full use of their high capacity machinery and did not have enough custom work.

The value of equipment available per acre of crops had little apparent affect on the distribution of the productive work between crops and livestock. An exception was for farms with $50 or more of equipment per acre of crops. On these farms more labor was expended on the livestock enterprises than on crops.

More productive-man-work units were accomplished per worker on the farms with a relatively large investment in machinery and equipment, but the association of equipment available per crop acre with labor efficiency was not always consistent, especially among the farms with less than $25 of equipment per acre in crops. The size and type of equipment among these farms, averaging $437 per farm, was of such low quality that it had little influence on the efficient utilization of labor. Crop yields were considerably higher on farms with a relatively large investment in equipment per acre in crops.

Relation of farm machinery and equipment per acre of crops to earn-

Table 38. Relation of equipment available to farm organization and operation, Negro owner-operated farms, Northeast Mississippi, 1951.

Equipment available per acre in crops	Number of farms in group	Acres in farm	Acres in cotton	Productive-man-work units	Percentage of productive-man-work units on		Average farm capital
					Crops	Livestock	
9 or less	15	96	7.0	310	49	41	$ 5,727
10-14	26	82	8.5	295	54	30	5,313
15-19	31	106	7.8	312	49	37	6,407
20-24	22	93	7.5	302	48	41	6,807
25-29	17	102	9.0	338	46	38	7,551
30-49	18	132	14.5	540	48	33	11,441
50 or more	7	127	11.0	507	39	50	12,791

	Percentage of cash receipts from		Productive-animal units per 100 acres in farm	Productive-man-work units per 100 acres in farm	Equipment per acre in crops	Productive man-work units per worker	Acres in crops per work animal	Crop yield index
	Cotton	Milk						
9 or less	34	16	15	323	$ 6	310	9	79
10-14	49	14	9	360	12	246	9	85
15-19	47	20	9	294	17	284	8	81
20-24	45	21	11	325	25	232	8	104
25-29	46	17	10	331	27	241	7	113
30-49	53	9	11	409	40	386	10	106
50 or more	42	23	16	399	64	422	6	136

Table 39. Relation of equipment available per acre in crops to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Equipment available per acre in crops		Number of farms in group	Average farm income	Average labor income	Total returns to labor per worker	Labor earnings			
						Range			Percentage of farms reporting $1,007 or more
Range (dollars)	Average					From	To	Average	
9 or less	$ 6	15	$ 203	—$ 83	$1,318	—$764	$3,321	824	40
10-14	12	26	313	47	1,123	— 993	3,373	820	31
15-19	17	31	332	12	1,412	136	2,542	1,050	39
20-24	25	22	301	— 40	1,166	— 402	2,422	911	50
25-29	27	17	668	291	1,316	— 603	4,145	1,224	53
30-49	40	18	1,211	639	1,819	189	4,488	1,561	67
50 or more	64	7	672	32	1,591	— 482	4,758	1,206	28

Table 40. Relation of capital efficiency to farm organiation and operation, Negro owner-operated farms, Northeast Mississippi, 1951.

Farm capital turn-over (years required for receipts to equal capital)	Number of farms in group	Productive-man-work units	Percentage of productive-man-work units on			Acres in farms	Percentage of crop-land in cotton	Average farm capital
			Crops	Livestock	Others[1]			
1.4 or less	8	362	46	28	26	93	28	$3,162
1.5-2.4	19	519	43	32	25	99	43	7,855
2.5-3.4	36	388	45	42	13	115	28	7,720
3.5-4.4	22	323	53	38	9	98	27	7,531
4.5-5.4	19	319	47	41	12	87	30	7,966
5.5-9.4	17	324	60	33	7	128	27	8,895
9.5 or more	15	152	56	35	9	78	25	5,019

	Productive animal units per 100 acres in farm	Percentage of cash receipts from		Acres in crops per work animal	Productive-man-work units per worker	Crop yield index	Equipment per acre in crops	Average farm receipts
		Cotton	Milk					
1.4 or less	8	33	17	11	402	85	$22	$2,730
1.5-2.4	13	55	8	9	288	93	23	3,863
2.5-3.4	12	41	21	9	323	103	26	2,608
3.5-4.4	11	57	15	10	248	112	20	1,883
4.5-5.4	16	47	15	8	290	100	22	1,562
5.5-9.4	7	46	19	8	294	72	23	1,328
9.5 or more	6	33	19	6	190	79	27	423

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[1] Largely labor off the farm by farmers including the use of their machinery and equipment in doing custom work for their neighbors as well as non-farm work requiring the use of their trucks.

ings. Farms with a relatively small investment in equipment per acre in crops, resulting from a small amount of equipment per farm, also obtained small earnings, Table 39. Farmers with a relatively large investment in equipment were obtaining progressively higher earnings providing the equipment available per acre of crops did not exceed $49. Where the equipment available per acre of crops was $50 or larger, the farmers were achieving, on the average, smaller earnings. In this case, these farmers were not making full use of their well-established and high-capacity machinery on their own farms and did not engage in enough custom work for their neighbors.

Capital Efficiency. Another underlying factor influencing farm earnings is capital efficiency. As with Negro farmers in other areas, capital was frequently scarce and very large portions often were invested in resources which added little to income. Efficient use of capital involves the proportioning of all, or as much as possible, of the available capital to enterprises or resources that produce an income. Many farmers had much of their capital invested in poor-quality livestock and had excessive expenditures for repairs on depleted equipment, buildings, and fences. Such spending, expecially when combined with insufficient money to maintain high-quality productive livestock or for fertilizer and poison for the cotton crop, represented the major inefficient use of capital on the farms studied and generally resulted in low farm earnings.

The measure of capital efficiency used in the subsequent analysis is capital turnover, which is the ratio of the gross farm receipts to the average farm capital. Since capital turnover reflects the number of years required for the gross farm receipts to equal the average farm capital, it follows that a large figure means lower efficiency in the utilization of capital. Capital turnover is influenced by the system of farming followed. It is slower for beef cattle than for other kinds of livestock, because of the period required from the time the calves are born or steers are bought before they are ready for the market. The period is relatively short for poultry because chickens normally produce a relatively large amount of gross income in a short time.

A wide variation occurred in the capital turnover from farm to farm, extending from less than a year on two farms to more than twenty years on two farms. The average for all farms was 3.6 years. Most farms, 70 percent, had a capital turnover falling somewhere from one and one-half to five and one-half years. Slightly more than one-half of the farms had a capital turnover less than three and one-half years.

Relation of capital turnover to farm organization and operation. The success of farmers in obtaining efficient utilization of capital was not consistently associated with other factors in farm organization and operation, Table 40. In general, the slowest capital turnover was obtained on farms with the smallest volume of business. Proportionally more of the productive work on farms with relatively slow capital turnover was expended on crops and less on miscellaneous activities, mostly off-farm work.

Crop yields were not consistently associated with capital efficiency. Crop yields averaged low on farms with the most rapid turnover, less than 2.4 years, as well as on those having the slowest capital turnover, more than 5.4 years. Highest yields for crops occurred on farms with average capital turnover, falling somewhere between 2.5 and 5.4 years. A rapid capital turnover was associated with a relatively high labor efficiency. Farmers with a capital turnover of under 1.5 years achieved, on the average, the equivalent of 402 productive-man-work units per worker, while those with 9.5 years or more achieved the equi-

Table 41. Relation of capital efficiency to farm earnings, Negro owner-operated farms, Northeast Mississippi, 1951.

Farm capital turnover (years required for receipts to equal capital)		Number of farms in group	Average farm income	Average labor income	Percent earned on capital	Labor earnings			Percentage of farms reporting $1,007 or more
						Range			
Range	Average					From	To	Average	
Less than 1.5	1.2	8	$ 902	$744	9.4	—$207	$2,924	$1,558	62
1.5-2.4	2.0	19	1,068	675	3.6	— 33	4,488	1,599	68
2.5-3.4	3.0	36	900	514	2.0	— 402	4,758	1,518	67
3.5-4.4	4.0	22	366	— 12	— 7.1	— 171	1,996	1,070	54
4.5-5.4	5.1	19	120	— 278	— 7.4	— 764	3,321	685	26
5.5-9.4	6.7	17	— 48	— 492	— 6.6	— 482	2,292	428	6
9.5 or more	11.9	15	— 230	— 481	—17.4	— 993	753	150	....

valent of only 190 productive-man-work units per worker. There was no consistent relation between differences in capital turnover and the investment in equipment per acre in crops.

Relation of capital turnover to earnings. The highest earnings were obtained on farms with a relatively rapid capital turnover, Table 41. The two groups of farmers who were most successful in using their capital, obtaining capital turnovers of 1.4 years or less and 1.5 to 2.4 years, obtained operator's labor earnings which averaged $1,558 and $1,599, respectively. The three groups of farmers who were least successful in the utilization of capital invested in the farm business averaged, in the order of increasing capital efficiency, $150, $428, and $685. The difference in operator's labor income between the group of farms that had an average turnover of 1.2 years and those requiring an average of approximately 12 years, was $1,225. The corresponding difference in the average net farm income was $1,132. Only on farms requiring fewer than 3.4 years for farm receipts to equal the farm's capital did the typical farmer earn anything on his capital invested in the farm business. Those farmers with capital turnover averaging 1.2 years had capital earnings at the rate of 9.4 percent; whereas, the farmers with an average capital turnover of 11.9 years lost on the average capital at the rate of 17.4 percent. The chance of a farmer's achieving labor earnings as large as $1,007 was around 2 in 3 with a rapid capital turnover of fewer than 3.4 years, but only 2 in 17 with a slow turnover of more than 4.4 years. Not more than 3.4 years should be required for gross farm income to equal the capital invested in the farm business in this area, if favorable earnings are to be obtained.

The advantage resulting from a rapid capital turnover becomes increasingly more important as the size of farm busi-

Table 42. **Operator's labor earnings on farms differing in capital efficiency and size of business, Negro owner-operated farms, Northeast Mississippi, 1951.**

Productive-man-work units	Farm capital turnover[1]	Number of farms	Labor earnings per farm
Under 200	Under 2.5	2	$1,168
	2.5-4.4	8	564
	4.5 or more	24	293
200-499	Under 2.5	20	1,321
	2.5-4.4	42	1,258
	4.5 or more	23	393
500 or more	Under 2.5	5	2,818
	2.5-4.4	8	2,601
	4.5 or more	4	1,587

[1] Years required for receipts to equal capital.

Table 43. **Relation of the number of efficiency factors in which farmers excel to earnings, Negro owner-operated farms, Northeast Mississippi, 1951.**

Number of factors in which farms were average or above[1]	Number of farms	Operator's labor earnings
None	12	$ 329
One	19	508
Two	25	797
Three	20	822
Four	25	1,102
Five	21	1,687
Six or seven	14	2,276

[1] The factors are: (1) size of business as measured by productive-man-work units, (2) crop yield index, (3) labor efficency as measured by man-work units per worker, (4) capital efficiency as indicated by farm capital turnover, (5) intensity of farming operation as indicated by man-work units associated with each 100 acres, (6) intensity of livestock production as measured by the amount of productive livestock associated with each 100 acres, and (7) value of farm equipment per acre in crops.

ness increased, Table 42. The differences in the average operator's labor earnings on small, medium, and large farms, and the most and the least efficient in capital turnover were $875, $928, and $1,231, respectively. Efficiency in the use of capital on large farms was especially important because of the relatively large amount of capital invested in these farm businesses. Also, farmers with relatively large capital investments were possibly as interested, if not more so, in the returns on the money invested in the business as they were in returns for their labor, because their farming systems required, in addition to the large capital investment per farm, a smaller portion of work to be performed by the operators themselves and a large portion of the work to be performed by members of the families, croppers, and hired workers.

Balance in Business

Analysis of data in the preceding section pointed out that many factors determined the earnings obtained by the farmers included in this study. On the basis of the relative importance of their effects on earnings, the seven major factors may be classed in the following order: (1) size of farm business, (2) capital efficiency, (3) crop yields, (4) labor efficiency, (5) value of farm equipment per crop acre, (6) intensity of farm operation, and (7) livestock intensity. A farm may be efficient as measured by some factors but show weakness when measured by the others. Some farmers were overemphasizing or depending too exclusively on one or two phases of the farm business at the expense of other important parts of the production. The study clearly demonstrates that well balanced farms, resulting from reasonable efficiency in all important factors within the control of the farmer, even though not outstanding in any, usually produced more favorable earnings than those farms which were superior in some factors but ususually weak in others, Table 43. Twelve farms in the sample were found to be below the average in all seven factors and produced average labor earnings of $329. In contrast, farms with at least six or seven important factors at the average or above, made labor earnings averaging $2,276. Under the conditions that prevailed during the period of this study, the increase in earnings resulting from average or above accomplishment in each additional factor was approximately $278.

It is clearly apparent from the foregoing data that it is possible for many Negro farmers in this area to make basic changes in their businesses, thereby increasing their earnings. These changes involve not only those necessary to develop a good business organization, but also those needed to operate it as efficiently as possible. Farmers should realize that their earnings are limited by the weakest point in the organization and operation of the farm business. Insofar as available resources tend to result in better than average accomplishments in each of the most important phases of the farm business, it is well to direct effort and money in improving the efficiency of those in which the farm is unusually weak.

The basic requirements for successful farming within the limits set by this study have been indicated to be as follows:

1. A sufficient size of business to provide enough work to keep the available labor force employed throughout most of the year. In this area, at least 423 productive-man-work units per farm and preferably even a larger number usually is desirable for efficient farming. Farmers with small acreages may attain a successful volume of business by renting in additional acreages, by planting a relatively high proportion of their land to cotton which requires a large amount of labor and produces a high value per acre, or by keeping more dairy cattle and selling more milk. Farmers, who for some reason cannot secure additional acreages to farm or cannot follow intensive systems of farming on their small acreages, may do well to use off-farm employment in nearby urban areas to supplement farm employment of their labor resources.

2. Good crop yields involving a crop yield index of more than 120, or yields which were at least 20 percent above the existing average for all farms in the area. The chance of a farmer making earnings of $1,000 was about 4 in 5 with yields of 60 percent or more above average but only 4 in 15 when yields were more than 60 percent below the average of all farms. Higher-than-average yields of cotton would be especially advantageous to farmers since this crop was a major source of income on more than one-half of the farms in the area. It is strongly suggested that the farmers follow the findings of the Agricultural Experiment Station in the kind and amount of fertilizer to apply to various crops on the various soils of the area, in the manner in which the crops are cultivated, in the care and selection of seed, and in the methods of controlling diseases and insects.

3. An efficient utilization of capital is a basic requirement for successful farming. When capital is scarce, as it generally is among farmers of this area, operators should be extremely careful not to invest a large proportion of it in resources that add little to income. Not more than three and one-half years should be required for gross income to

equal the capital invested in the farm business. The chance of a farmer's achieving earnings as large as $1,007, is around 2 in 3 with a rapid capital turnover of fewer than three and one-half years, but only 2 in 7 with a slow turnover of more than four and one-half years.

4. Successful farming is dependent on an efficient utilization of labor. The minimum amount of productive labor that should be accomplished per worker should be the equivalent of 300 man-work units. No general principles are advanced here which will apply to all farmers relative to how they may increase their labor efficiency. However the things which a farmer should find helpful in checking the strong and weak points of his labor-management program and in planning for improvements are: (a) enlarging the size of the farm business so as to provide more productive work; (b) developing a labor distribution program so as to include more livestock to supplement and complement crops in order to furnish year-round employment for family labor; (c) using more and better-adapted farm equipment to the fullest possible limits, and (d) improving the personal management of the labor force.

5. Use of well-established farm equipment adapted to the working requirements of the individual farm. Not only is a sufficient investment in farm equipment needed, but this equipment will have to be operated in an efficient manner for the economies in labor which normally resulted from the use of high capacity equipment to be reflected in higher earnings. Expensive mechanical power cannot be justified on a farm, especially one with a relatively small volume of business, unless the labor supply available has some alternative use. Farmers with medium to large acreages in their farms will do well to investigate the possibility of obtaining a tractor and the necessary attachments. The investment in power equipment on small farms should be at a minimum. Expensive equipment, such as tractors and attachments, usually can be hired more economically than it can be owned, unless there is sufficient work to be done on the farm or custom work is available to justify the purchase. Larger mule-drawn equipment may also be needed. Half-row equipment is no longer used by progressive farmers because it does not permit economizing in the use of labor. With more and better-adapted equipment each worker is usually able to handle more acres of crops and can accomplish more productive-man-work days at a relatively low equipment cost per acre and per day.

6. A combination of enterprises to make up the operating farm unit, providing for dairying, livestock production, and cotton. Favorable earnings can usually be achieved in this area under conditions of diversification where farmers stock their farms with sufficient amounts of livestock to supplement or complement cotton production in the employment of family labor and to provide consumption of forage crops. This involves a livestock stocking of at least 11 productive-animal units to each 100 acres in the farm and preferably a heavier stocking in many cases. When at least 21 units of livestock were maintained per 100 acres, the chance of achieving earnings as high as $1,007 was 2 in 3, compared with less than 1 in 8 when fewer than 5 units of productive livestock were kept per 100 acres. For most farmers this will involve increasing the carrying capacity of the available pasture area by means of a pasture improvement program and taking in idle land for grazing rather than eliminating any of the tilled crop acreage. In general, the best-paying farms were those involving large business units heavily stocked with livestock which was efficiently handled and where a moderate proportion of the cash in-

come was derived from the sale of milk and cream. It did not appear to be highly successful to specialize in dairying, where farmers produced milk for processing purposes instead of the Grade A market. This was especially true among the Negro farmers of this area, due to the low quality of dairy animals kept, poor feeding methods followed, and poorly balanced feeds, all of which result in low production per cow annually and during the winter months.

7. A farm business so organized that at least 343 productive-man-work units would be associated with each 100 acres in the farm. This calls for a more intensive use of the present acreage as well as the possibilities of some increased acreage on small farms. To add more land without combining more labor with each acre would not solve the problem in itself. Hence, changes in the organization of farms are needed in the majority of instances in order to obtain larger receipts per tillable acre. This can be done to some extent by selecting kind of livestock which are heavy users of labor. More dairy cows, if efficiently handled, will result in larger receipts per acre, thereby increasing the volume of business so necessary on small farms. Many farmers, especially those lacking large acreages to operate, may do well by keeping larger numbers of poultry. More emphasis may even be placed on commercial hog production. A change from producing milk and cream for cheese and butter manufacturing to producing for Grade A market results in greater intensification of farming operations even with the same size of dairy herd. A more intensive farming operation may be achieved through increased rates of production resulting from better cultural practices on crops even though the acreages remain unchanged. Stepped up fertilization, substitution of hybrid for open-pollinated corn, and other similar practices are good examples which farmers in the area should follow.

Summary And Conclusions

Northeast Mississippi, as delineated for this study, was comprised of 13 counties and included approximately 14 percent of the State's land area and an equal portion of its population. This study was conducted in this area in order to obtain basic information pertaining to farming from the standpoint of the Negro farmer. It was felt that a study of farm organization and operation of Negro owner-operated farms would be particularly helpful to the farmer seeking to increase his earnings as well as to the agriculturist advocating the adoption of better farming techniques.

There is considerable variation in the character of the soils and topography in this area. The soils range in texture from sands to heavy clays, and the topography from the relatively flat prairie lands to the extreme hills of Tishiming County, where the elevation rises to the highest point in the State, 806 feet. Northeast Mississippi is composed of four general soil areas: (1) Northeast Prairie, (2) Northeast Highlands, (3) Pontotoc Ridge, and (4) Flatwoods. Clay County, the location of the intensive study on which this report is based, has all four of the soil areas passing through its borders, and is thus the one county that is representative of Northeast Mississippi in the general soil characteristics. This county is also considered to be reasonably typical of much of the farming areas of 12 other northeastern counties in general farming conditions.

The area as a whole has a normal annual rainfall of 51 inches which is ample for abundant crop production, when properly distributed throughout the growing season. The frost-free season for growing crops varies from 196 days in the extreme northern part of the area to 226 days in the south. The average for the entire area is 217 days. The first killing frost in the fall occurs usually during the first five or six days in November and the last varies from the last five days in March to as late as April 10. The relatively mild winters eliminate the need for expensive housing for livestock.

Northeast Mississippi is predominately a rural area, but industrial activity has increased in the cities, particularly in trades and service industries. In 1950, the rural population represented 78 percent of the total population; the urban portion comprised 22 percent. In five counties, the total population was classed as rural; others ranged between 55 and 83 percent rural. Two-fifths of the urban population live in Columbus and Tupelo, the only cities within the area of more than 10,000 inhabitants. The population has not changed rapidly in recent years except in counties where the larger cities are located. For the most part, the increase in the number of inhabitants of the area has been the result of a large enough increase in the white population to outweigh the migration of Negroes to other areas.

Agriculture is the principal industry. The principal non-agricultural industries are manufacturing, wholesale and retail trade, and the personal and professional services. A number of persons in each county are employed in such industries as construction, transportation, communication, public utilities, sanitary services, and amusement. The relative importance of these industries as sources of employment is small. A larger portion of Negro workers derive their income from agriculture than do white workers. Personal service work (mostly in private households, hotels and lodging places, and in laundry-cleaning establishments) employs proportionally many times more Negro workers than white workers. A significantly larger portion of white than Negro workers are employed in such industries as manufacturing, merchandising, some of the professional services, and construction. In the construction industry and many of the professional services, the differential between the races is not very large, but proportionally fewer Negroes than whites have been obtaining their livelihoods from these industries.

Marketing facilities are reasonably adequate for handling the crops and livestock that form the present farming pattern in the area. Gins are accessible to all farmers. The area is well served by milk receiving and processing plants. Facilities for marketing livestock are available. More than 600 buyers and processors of forest products are active in the area and the timber-using industries are well developed.

Each county is served by one or more railroads. The area is traversed by a network of Federal and State highways. County-maintained secondary roads, reaching out-lying points in the rural areas, are well graded and passable at all times except in periods of unusually heavy rainfall.

Significant changes have been taking place in the tenure pattern of Northeast Mississippi. Since 1930, farm ownership has shown a continuous upward trend, while tenancy has been declining. Tenancy has declined at a faster rate than ownership has increased, as a consequence of the reduction in the number of farms. The proportion of tenant-operated farms among Negro farmers in this area has been higher than for white farmers. Tenancy on Negro farms varied according to local conditions and tended to be lowest in those counties with the smallest number of Negro farms and also in the predominately dairy county of Oktibbeha.

The farming systems involving cotton as the principal source of income predominated among the farms of this area, and the cotton crop was of considerable importance on farming systems emphasizing livestock production and dairying. Of the farmers who depended heavily on cotton as a major cash crop, two out of five depended almost entirely on the cotton crop, whereas the others supplemented the cotton crop with a livestock enterprise, mostly dairying. Because milk was an important supplemental source of income on most farming systems, dairying was of much greater importance in the area than was indicated by the number of farms classed as dairy farms. Farms involving the general farming system were numerous in the area. Poultry and hogs were not highly significant commercially but were side-line enterprises on a large percentage of the farms.

The farms studied averaged 102 acres in size and ranged from 17 to 665 acres. Nearly three-fourths of the farms contained over 30 but less than 150 acres. About 29 percent of the land in farms was utilized in growing crops, representing four-fifths of the total land available for crop production. Pastures occupied 54 percent of all farm land, of which two-thirds constituted open or tillable land and the other one-third was fenced-in timber land. Only one out of each eight acres of the open pasture had been clipped, seeded, fertilized, or limed. Nearly all farms included a little woodland, 9 percent of the farm land, which was not fenced in for pasture.

Three crops occupied over 90 percent of the land in crops. Cotton was the main source of income on most farms. Cotton was grown on 95 percent of the farms surveyed and on 30 percent of the crop area. Corn occupied a greater acreage than any other crop. Some corn was grown on all farms and on more than one-third of the crop area. Hay was an important crop on two-thirds of the farms and occupied about one-fourth of the acreage. Johnson grass was generally the leading hay crop, followed by lespedeza and soybeans. Other hay crops included clover and sorghum and were of minor importance except in local areas.

Livestock production and dairying are of considerable importance on farms in Northeast Mississippi. The average number of livestock kept on farms during the period under study were 7 dairy cows, 4 young cattle, 3 horses and/or mules, 1 brood sow, and 41 chickens. There were few purebred dairy cows or beef cattle found on Negro farms, although registered purebred livestock were quite common in the area. Most milk cows were grade Jerseys of poor quality. A few farmers were using purebred bulls and in this way have bred their dairy cows up to a satisfactory standard. Purebred beef cattle were mostly of the Hereford breed. Much improvement has been made in the quality of hogs raised, with purebred hogs fairly common. The Poland-China was the breed most frequently found.

The typical Negro farmer in this area had, along with his own labor, several months of family labor during the year. On most farms, the operator did most of the work himself unless he had a relatively large farm with several cropper families. Some hired labor was necessary during peak labor seasons on most farms, particularly during cotton chopping and again during the harvest. The farms averaged 350 productive-man-work units during 1951. Almost one-half of this was on crops; more than one-third on livestock; and the remainder was largely custom labor on the farms of neighbors and non-farm work in the near-by urban areas. Each worker, on the average, accomplished the equivalent of 288 10-hour days of work, or man-work units, and handled the equivalent of 25 acres of crops during the year.

The average investment per farm was $7,326, of which 63 percent was in land and buildings, 22 percent in livestock, 10 percent in farm machinery and equipment, and 3 percent in feed and supplies inventories. Based on farmers' estimates of the value of real estate they owned, the average land value in this area, including buildings and other improvements, was about $48 per acre. Twenty-four percent of this land was estimated at less than $30 per acre, while 13 percent was valued at $75 per acre or more.

Although remarkable progress has been made in recent years in the substitution of mechanical for animal power, work stock was still the most important source of power on most farms. Most farmers used two-mule and full-row equipment, in contrast to the one-mule and one-row equipment still prevalent in many Upland areas of the State. Most of the farmers who owned tractors continued to use mule-drawn equipment to cultivate their crops and used their tractors only in harvesting hay and in breaking the cropland. About 37 percent of the farmers used either an automobile or a truck for farm purposes. Tennessee Valley Authority electrical power was available to every farm in the area at a reasonable rate, and home electrification was found on 59 percent of the farms.

The average farm receipts amounted to $2,126, of which 79 percent was cash receipts and the remaining 21 percent was increases in farm capital. This large capital increase reflected the action of farmers in building up certain phases of their livestock herds, particularly cattle, in buying more tractors and other equipment, and in improving their buildings. The average farm expense was $1,642, of which three-fifths represented cash costs. The average net farm returns was $688 for cash farm income, $484 for operator's farm income, $118 for operator's labor income, $1,054 for operator's labor earnings, and a 3.3 percent loss on the average farm investment. The typical farmer in this area had a large portion of his farm expenses in non-cash items, a large amount of products furnished by the farm for family living, and a relatively small debt. Hence, he was usually able to achieve a fairly comfortable living with a small amount of cash farm income from the year's operation.

The major factors that determined the earnings obtained by farmers within the limits of this study were those relating to the size, the organization, and the operation of the farm business. Since these are factors over which the individual farmer has control, it will be through them that many Negro farmers will be able to make basic changes in their businesses which will permit opportunities for increased earnings. On many farms changes are needed in order to develop good business organizations, and on most farms additional considerations should be given to operating the entire business as efficiently as possible.

Differences in the sizes of businesses were of paramount importance in accounting for variations in the earnings among farms. The farmers with relatively large business units were achieving earnings several times more than those with relatively small business units, except in instances where other important phases of the business organization and operation were not efficiently developed. The average earnings on farms of less than 200 man-work units or 90 acres in size were relatively low. It was necessary for a farmer to operate a business exceeding approximately 500 man-work units in order to obtain labor earnings as large as $3,000. Labor earnings exceeding $4,000 were found on farms that averaged 1,366 man-work units.

The earnings of farmers were also influenced by the over-all business organization, which had to do with the manner in which farm enterprises were selected and combined to suit the conditions under which the farms were operated. The highest earnings were generally found on those farms which had a combination of enterprises in the business units providing for cotton, dairying, and livestock production. Farm earnings were found to be most favorable under conditions of diversification, where farmers stocked their farms with sufficient amounts of productive livestock to supplement and complement cotton production in the employment of family labor and to provide for consumption of forage crops. Farms having a moderate proportion of the cash income derived from the sale of milk and cream obtained higher earnings than when the dairy enterprise was either dominant in the farm organization or received little emphasis. The farmers were obtaining favorable earnings through the process of combining more productive man labor with land, provided they were operating their farms at a favorable level of over-all efficiency.

Finally, the earnings accruing to farmers under the conditions of this study were affected significantly by the efficiency with which the entire farm business was operated, which reflected the use of technical farm practices regarding production and the manner in which the farms were operated. Farm practices that resulted in relatively high crop yields produced favorable earnings. Higher-than-average yields of cotton were especially advantageous to the farmers since this crop was a major source of income on more than one-half of the farms in the area. Farmers who obtained efficient utilization of their labor force also obtained relatively high earnings. Another underlying factor influencing farm earnings was capital efficiency. The highest earnings were obtained on the farms with a relatively rapid capital turnover of less than 2.5 years. The advantage resulting from a rapid capital turnover was more important on large farms than on small farms, because more capital was invested in the large-sized businesses. The ability of farmers to achieve good earnings depended also upon having ample farm equipment adapted to the requirements of the individual farms. Farms with a small amount of equipment, reflected by a relatively small investment in equipment per acre in crops, generally obtained small earnings.

A direct relationship existed between the equipment available per acre in crops and earnings until $49 worth of equipment was invested per acre, beyond which the equipment was not being operated in an efficient enough manner for the economies in labor to be reflected in higher earnings.

The study indicates that well-balanced farms, resulting from reasonable efficiency in all important phases of the business within the control of the farmer even though not outstanding in any, usually produced more favorable earnings than those which were average or above in some parts of the business but below average in others. Efficient management in all of the important phases of the business resulted in earnings which averaged $1,947 higher than where low efficiency prevailed in all phases. For each additional major phase of the business in which a farmer was able to excel, there was an average increase in labor earnings of approximately $278.

APPENDIX

Definition of Terms and Methods Used in Computing Organization and Operation Factors

Owner-operator is a farmer who owned all or part of the land he operated. Included were farmers who owned all of the land which they operated plus those who rented additional acreage in order to enlarge their farming operations. A few farmers were included who rented out to others a portion of their farm land which otherwise would have been left idle. In the strict sense, some of these farmers would be classed as part-owner-operators and a few would even be classed as owner-operator-landlords.

A **farm** is one or more tracts of land, including improvements, normally contiguous, and operated by a single management as a unit for agricultural production. Included was all of the land cultivated by one set of workstock and equipment, whether operated entirely by an individual or family, or by more than one family under one person's management. Therefore, land worked by croppers was not included as separate units but was considered as a part of the operating units on which they were located.

Cropland is that part of the farm area normally used for the production of crops, or for summer fallow or temporary grazing. It included both the area of land on which crops were either growing or were harvested during the year and the land ordinarily used for crops when allowed to lie idle during the growing season. These two classes of cropland are referred to as **tilled** and **idle** cropland, respectively.

Farm capital or farm investment is the average value taken at the beginning and ending of the farm year of all farm property. It included real estate and improvements, farm machinery and equipment, workstock and other livestock, and feed, seed, and supplies on hand and used to carry on the farm business. It included the value of the farm dwelling but not the house-hold furnishings. The inventory dates used in this study were March 1 for the beginning and February 29 for the ending of the farm year.

Crop yield index is a measure of comparison of crop yields on a given farm with the average yields of a group of farms operating under similar conditions on somewhat similar soils. Its use is to express the crop yields of each sample farm by comparing it with the average crop yields of all farms studied. The relationship is expressed as a percentage. Only the major crops grown in this area including cotton, corn, Johnson grass hay, lespedeza, cowpeas for hay, coybeans for hay, clover hay, sorghum hay, and other native grass hay were included in this index. The yield of each crop was weighted by acres harvested.

An **animal unit** is the equivalent of a mature, average-sized cow or horse, and its determination is generally based on feed consumption and manure production. In expressing other livestock in terms of an animal unit, the equivalents used were 2 head of young cattle, such as heifers and steers, or 4 calves less than 6 months old; 5 brood sows or other mature hogs, or 10 pigs or shoats; 7 mature sheep or goats, 14 lambs or kids; 2 colts; or 100 fowls. It is computed by taking the average of the beginning and ending inventories.

A **productive animal unit** is an animal unit which increases the income of the farm by its own growth, by producing young, or by some livestock product as

Appendix Table 1. Estimated man hours and power required per acre of crops and per unit of livestock on Negro farms in Northeast Mississippi.

Enterprise	Total hours		Distribution of man hours by months											
	Man	Mule	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Crops:														
Cotton	99.5	46.8	1.1	1.5	1.5	5.5	18.7	15.8	11.8	4.6	20.4	15.8	2.8	......
Corn	37.0	41.6	0.8	1.4	3.2	6.6	9.7	6.0	0.8	......	......	4.5	3.0	0.8
Soybean or pea hay	28.0	32.7	......	......	......	3.6	3.4	1.1	......	8.4	8.4	1.3	1.1	0.7
Johnson grass hay	24.6	28.9	......	......	......	......	0.8	10.6	7.3	1.6	2.4	1.9	......	......
Lespedeza hay	19.0	18.5	......	0.8	......	......	......	......	......	9.5	9.4	......	......	......
Wild hay	20.0	18.3	......	......	......	......	......	5.0	5.0	5.0	5.0	......	......	......
Oats for hay	18.3	20.2	......	......	1.5	......	9.2	......	......	......	......	4.6	3.0	......
Cowpeas and soybeans (seed)	17.0	17.6	......	0.6	1.8	2.9	3.5	1.2	0.6	4.7	1.8	......	......	......
Sorgo syrup	124.1	26.6	......	......	4.5	3.1	5.3	7.7	6.3	......	48.5	48.5	......	......
Sweet potatoes	112.0	59.0	......	......	8.5	18.5	24.0	8.6	......	......	9.5	42.4	......	......
Peanuts	60.0	36.0	......	......	6.8	6.8	7.3	5.8	1.4	......	22.7	......	9.1	......
Watermelons	73.0	66.0	1.4	7.2	7.8	8.0	9.8	7.8	19.2	11.7	......	......	......	......
Garden	147.0	56.0	2.8	2.8	24.5	31.5	25.0	25.2	17.6	14.1	14.0	14.0	1.7	......
Improved pasture, established	99.0	90.0	24.4	26.3	......	......	5.1	......	2.6	11.4	4.4	2.0	......	24.4
Improved pasture, maintenance	5.0	10.0	......	......	1.2	......	1.2	......	1.6	......	......	......	......	1.0
Livestock per animal unit:														
Workstock	59.0	......	4.5	4.5	5.5	5.5	6.0	6.0	5.0	4.0	4.5	4.5	4.5	4.5
Dairy cows—commercial use	163.0	......	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	14.0	14.0	14.0
—farm use	100.0	......	10.0	10.0	9.0	9.0	8.0	7.0	7.0	7.0	7.0	8.0	9.0	9.0
Beef cows	28.0	......	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0
Heifers or bulls	20.0	......	2.0	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.0
Steers or calves	20.0	......	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	......	......
Sow and pigs	59.0	......	5.0	5.0	6.0	5.0	5.0	4.0	4.0	4.0	5.0	6.0	5.0	5.0
Other hogs butchered for	15.0	......	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.0	2.0
home use—market use	10.0	......	......	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	......
Poultry	125.0	......	9.0	10.0	12.0	15.0	15.0	13.0	10.0	8.0	8.0	8.0	8.0	9.0
Ewes	3.0	......	0.6	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.6

Source: Estimations based upon the following studies: Saville, R. J. and Gaines, J. P., "Production Practices for Selected Crops in Mississippi, 1947," Mississippi Agricultural Experiment Station Mimeographed Report No. 6, 1951. Parvin, D. W., "Handbook of Labor, Power, Materials. Production Rates and Costs for Mississippi Crop and Livestock Enterprises." Mississippi Agricultural Experiment Station Mimeographed Report No. 1, 1947. Slusher, M. W. and Wilson, W. T., "Labor and Power Used for Arkansas Crops and Livestock," Arkansas Agricultural Experiment Station Bulletin No. 456, 1945. Hedges, Trimble R. and Slusher, M. W., "Adjustments in Farm Organization for Increasing Income in Hempstead County," Arkansas Agricultural Experiment Station Bulletin No. 442, 1943. O'Leary, W. G., "Organization and Operation of Farms in Black Prairie Area, Mississippi," Mississippi Agricultural Experiment Station Bulletin No. 404, 1944.

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Appendix Table 2. An illustration of favorable and unfavorable conditions affecting systems of farming in Northeast Mississippi.

Enterprise	Favorable conditions	Unfavorable conditions
Cotton	Cash crop gives higher return to labor per acre than any other crop which can be produced and marketed in large quantities; adapted to soil and climate; has favorable market conditions; utilizes labor of whole family; fits size of farm; has low machinery requirements; uses greater experience of farmers in production methods.	Has uneven distribution of labor; keeps children from school for picking; low yields in area limit mechanization beyond cultivation; may have boll weevils and bollworms; has high fertilizer requirements.
Corn	Feed crop, supplements cotton in labor distribution; good yields under favorable management practices and on suitable soils.	Has high fertilizer requirements.
Dairy	Area well served by milk marketing and processing plants; suitable to a greater proportion of farms because of the small size of the majority of farms, higher returns per acre than for beef cattle; supplements and complements crop production for furnishing year-round employment of family labor, perhaps the only enterprise giving winter employment; furnishes the markets for feed, Johnson grass and other hay; excellent pasture under favorable management practices; furnishes milk for home consumption; provides bi-weekly income for family living; helps scatter income over year by bi-weekly pay checks; helps build soil fertility; gives balance to the business.	High price of hay and grains; requires high outlays of capital, such as buildings and equipment; prevalence of small farms where highest returns per acre are necessary to give ample volume of business.
Beef cattle	Good market; good profit; suitable pasture if properly managed; requires less expensive buildings and equipment than dairy cattle; suitable climate; most suitable to large farms, complementing and supplementing cotton, grain, and forage crops; value of manure.	Smallness of majority of farms; competition with dairying; high price of feed; limited credit and capital on most farms; lack of technical knowledge of livestock management.
Poultry	Excellent markets in near-by urban areas; fits in well on farms where feed production is relatively low and most of the feed needs to be bought; excellent climate and soil; production of home supplies of meat and eggs; utilization of spare time and waste material; fits in especially well on small farms because it gives a large income on a small area; quick returns.	Competition from small farm flocks everywhere; requires good management and good houses; danger of disease such as cholera and predatory animals; work calls for constant and faithful effort; best adapted to farming areas within a radius of a few miles of the cities.
Hay	Well adapted to area, especially Johnson grass, lespedeza, soybeans, and clovers; usefulness as feed for livestock; high prices.	Short season of employment but requires a limited amount of hired labor in August and July to help in the hay harvest.
Hogs	Good markets at local packing plant, local auction and other local buyers; good pasture under suitable management; furnishes pork and lard for home consumption; utilizes grain produced in excess of the needs of forage consuming animals such as dairy and beef cattle; small capital required both in developing and in carrying on; quick returns (within in a year brood sows provide an income).	Susceptibility of disease , especially cholera, pneumonia, tuberculosis; irregular and sudden fluctuations in prices; competition with dairying; high price of concentrates.

Appendix Table 2. An illustration of favorable and unfavorable conditions affecting systems of farming in Northeast Mississippi.—(Continued)

Enterprise	Favorable conditions	Unfavorable conditions
Sheep	Favorable markets; climate; forage crops; low capital outlays required.	Susceptibility of parasitic infestation is high; lack of technical knowledge in sheep management; competition with dairying.
Truck crops	Furnishes home supplies; limited market outlets are possible in near-by cities.	Limited to local market demands; competition of better soil area.
Oats	Value as feed; fits well into a balanced farming system; suitable for complete mechanization; good as a temporary winter grazing crop for dairy and beef cattle; utilizes labor otherwise unused.	Small value per acre; special machinery requirement unless custom work is used; climatic conditions—smut and rust.

milk or eggs. All livestock in this area may be considered productive with the exception of workstock.

The **man-equivalents** represent the average number of workers used in the operation of the farm during the year, employed at full time. It is computed by establishing the total months that the operator and all other paid and the unpaid laborers actually worked on the farm during the year and dividing this sum by 12 months. The work of women and children was reduced to an equivalent in full-time man labor as follows: boys, 14-17 years old = 0.6 equivalents; boys under 14 years of age and all females = 0.3 equivalents.

A **productive-man-work unit (PMWU)** is the average amount of work accomplished by one man in 10 hours. The total productive-man-work units for a particular farm represent the number of 10-hour days required, under average working conditions and abilities, to do all of the work necessary in the direct production of crops, livestock, livestock production, and other productive work which added to the income of the farm. In computing the total units of productive work for each farm studied, the acreage in each crop grown and the number of animal units of each class of productive livestock kept were multiplied by the average estimated labor requirements of farm enterprises on Negro farms in the area. Work off the farm for wages and other productive endeavors which added to the income of the farm were converted to its equivalent in 10-hour days and added. The equivalents used in expressing this productive work in terms of a man-work unit, when only the total receipts received from these sources were reported, were $4 of man labor away from the farm; $8 of man labor away from the farm with team; $12 of man labor away from the farm with tractor; $10 of man labor away from the farm with truck; or $12 received from the sale of lumber, ties, and pulpwood.

The **productive-man-work units per worker** represent the total number of productive-man-work units performed on the farm during the year divided by the number of workers or man-equivalents.

Appendix Table 3. A guide to pasture feed-crop production in Northeast Mississippi.

Crop	Seeding rate per acre	Fertilizer recommended per acre	Time of planting	Approximate grazing season
Black medic	15 lbs. seed on Johnson grass	60 lbs. of Phosphate	Sept. 1-Oct. 15	Jan. 1-Apr.15
Johnson grass	20 lbs.	60 lbs. of N	Dec. 1-Mar. 1	Apr. 15-Nov. 1
Dallis grass	15 lbs.	Fertilize with Legumes by growing with white clover	Aug. 15-Nov. 1 Feb. 15-May 1	Apr. 15-Nov. 1
White clover	3 lbs. seed on Dallis grass	To establish 90 lbs. of P_2O_5 plus 50 lbs. of K_2O; to maintain 60 lbs. of P_2O_5 and 25 lbs. of K_2O	Sept. 1.-Oct. 15	Feb. 1-June 15
Wild winter peas	50 lbs. seed on Johnson grass	60 lbs. of P_2O_5 25 lbs K_2O	Sept. 1.-Oct. 15	Feb. 1-June 15
Oats	3.0 bu seed on Johnson grass in combination with black medic	60 lbs. of N at planting, 30 lbs. of N Jan. 15 to 30 lbs. of N Mar. 15 P_2O_5 and K_2O according to soil test	Sept. 1.-Oct. 15	Dec. 15-Mar. 15
Lespedeza Sericea	35 lbs. seed on Dallis grass following oats	60 lbs. of P_2O_5 25 lbs. of K_2O	Feb. 1-Apr. 1	Apr. 1-Nov. 1
Lespedeza Kobe or Korean	25 lbs. seed in oats	60 lbs. of P_2O_5 25 lbs. of K_2O	Feb. 1-Apr. 1	July 1-Oct. 1

Pasture management: (1) Seed one-fourth of permanent pasture to grass-spring clover (preferable Dallis grass with white clover) and three-fourths to grass-summer legume (preferably Dallis grass with lespedeza. (2) Seed an adapted supplementary or temporary grazing crop, prefeably oats and black medic on Johnson grass, at the rate of one acre per animal unit and wild winter peas on Johnson grass, one acre per animal unit. (3) Mow permanent pasture twice annually. (4) Mature Johnson grass should be grazed from the time the permanent pasture goes out until oats are ready, oats and wild winter peas from January 1 to April 15, permanent pasture and Johnson grass from April 15 to November 1. (5) Apply 200 to 400 lbs. of superphosphate or 500 to 800 lbs. of basic slag and 50 to 70 lbs. of potash per acre annually. On Post Oak Prairie (Red) soils, apply 500 to 1,000 lbs. of lime every fifth year.

Source: Adapted largely from H. W. Bennett, "Pastures for Mississippi" Mississippi Agricultural Experiment Station Circular No. 151, pp. 1-13, 1950.

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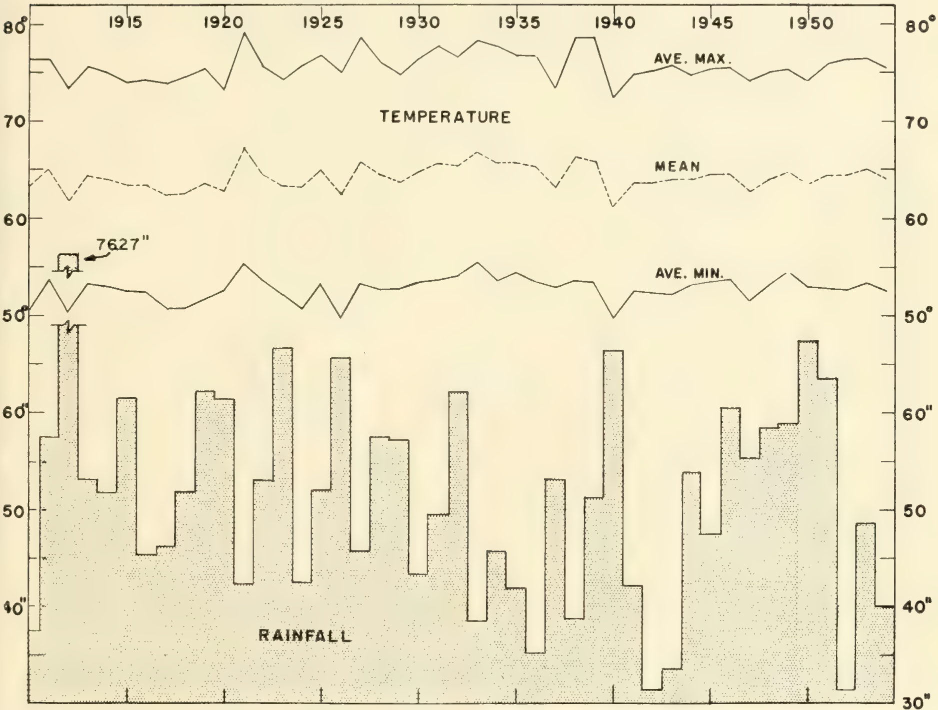
WEATHER RECORDS

At State College, Miss.



The coolest year on record at State College was 1940, with an average temperature of 61.1 degrees. The year 1921 produced the warmest temperatures when an average of 67.3 degrees was recorded. This was 3.2 degrees above the 45-year average of 64.1; whereas, the 1940 temperature was 3 degrees below average.

The yearly rainfall varied from 31.32 inches in 1952 to 76.27 inches in 1912. The 66-year average is 50.84 inches.

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Average annual temperature and total annual rainfall.

Year	Average temperature in degrees Max.	Min.	Means	Total annual rainfall in in.
1910	76.3	50.7	63.5	37.46
1911	76.4	53.9	65.2	57.52
1912	73.4	50.3	61.9	76.21
1913	75.8	53.3	64.5	53.13
1914	75.1	53.0	64.0	51.87
1915	74.0	52.5	63.3	61.48
1916	74.2	52.3	63.3	45.20
1917	73.9	50.8	62.3	46.24
1918	74.6	50.7	62.6	51.97
1919	75.3	51.8	63.5	62.62
1920	73.2	52.6	62.9	61.21
1921	79.3	55.3	67.3	43.23
1922	75.6	53.8	64.7	53.06
1923	74.2	52.2	63.2	66.61
1924	75.8	50.6	63.2	42.53
1925	76.8	53.1	65.0	52.03
1926	75.0	49.8	62.4	65.66
1927	78.7	53.2	65.9	45.85
1928	76.0	52.8	64.4	57.61
1929	74.8	52.8	63.8	57.31
1930	76.3	53.5	64.9	43.27
1931	77.7	53.8	65.8	49.63
1932	76.7	54.1	65.4	62.08
1933	78.3	55.5	66.9	38.58
1934	77.7	53.8	65.8	45.84
1935	76.9	54.4	65.7	41.94
1936	76.8	53.5	65.2	35.25
1937	73.3	53.0	63.2	53.13
1938	78.7	53.8	66.2	38.94
1939	78.6	53.3	65.9	51.35
1940	72.3	49.8	61.1	66.30
1941	74.8	52.6	63.7	42.09
1942	75.1	52.3	63.7	31.38
1943	75.8	52.2	64.0	33.67
1944	74.9	53.1	64.0	53.98
1945	75.3	53.5	64.4	47.53
1946	75.4	53.8	64.6	60.39
1947	74.2	51.6	62.9	55.36
1948	75.0	53.2	64.1	58.54
1949	75.3	51.6	64.9	59.01
1950	74.2	53.0	63.6	67.37
1951	76.0	52.9	64.4	63.43
1952	76.4	52.8	64.6	31.32
1953	76.6	53.4	65.0	48.58
1954	75.5	52.7	64.1	40.08
45 year average	75.7	52.8	64.3	50.84

Weather Records At State College, Miss.

By J. C. McWHORTER

The weather is of interest to every inhabitant of the world, since it affects his comfort, health, work, and many other activities. The farmer has a particular interest in weather and its variations. It affects practically every aspect of his operations from day to day; therefore, he regards the daily and long range weather forecast as a guide to planning.

It would be invaluable if future weather conditions could be foretold with certainty. Although this is not now possible, analysis and study of past records may reveal various weather trends. Frequently studies indicate how often a given quantity of precipitation in a certain period of time, and drought periods of certain duration, may be expected.

Weather Observation

The weather station at State College, Mississippi, is one of thousands of cooperative observation stations in the United States furnishing data to the U. S. Weather Bureau. Operated by the Mississippi Agricultural Experiment Station, it has records of precipitation and temperatures dating from January, 1910. Monthly precipitation records are available beginning with January, 1889.

It is generally conceded that annual rainfall in this area is sufficient, but distribution throughout the year frequently is unfavorable for crop production. Therefore, the value of annual records can be enhanced greatly by a study of weather conditions by months. For this reason the Mississippi Agricultural Experiment Station has assembled and is publishing this long-time record of temperature and rainfall. By showing what the weather has been each month throughout the years, the records indicate what may reasonably be expected in the future.

Temperature Records

Temperature records are presented in degrees Fahrenheit as average monthly maximum, average monthly minimum, mean monthly, and average annual temperature; and are determined as follows:

Average monthly maximum is the sum of daily maximums divided by the number of days in month.

Average monthly minimum is the sum of daily minimums divided by the number of days in month.

The mean monthly temperature is the mean of the average monthly maximums and minimums. The average annual temperature is the mean of the 12 monthly mean values.

Precipitation Records

The term precipitation includes rain, snow, hail, and sleet—all forms of moisture that fall from the clouds. For all practical purposes, precipitation as reported at State College means rainfall as there is little snow, hail or sleet. Rainfall is expressed in inches and hundredths of inches of water depth; and snow, hail and sleet are converted to their equivalent depth of water.

Rainfall records (meaning total precipitation in this report) are presented as monthly, annual, average monthly, and average annual amounts.

ACKNOWLEDGMENTS

Throughout the years many Experiment Station staff members have accumulated this weather data. The list includes: W. R. Perkins, E. R. Lloyd, J. R. Ricks, Charles F. Briscoe, T. N. Jones, Russell Woodburn, and R. F. Dudley.

Temperature records at State College, 1910-1954.

	January		February		March		April		May		June	
Year	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.
1910	57	34	55	32	78	50	77	49	86	52	87	63
1911	60	40	64	45	71	46	74	52	87	60	90	69
1912	51	22	56	31	61	41	76	53	85	60	85	63
1913	61	40	54	36	65	43	74	51	84	59	93	67
1914	59	37	56	35	62	41	76	52	84	60	97	72
1915	52	33	60	38	58	36	80	52	86	61	83	68
1916	59	41	58	33	68	46	74	51	85	62	83	65
1917	59	41	59	39	65	45	75	52	79	51	90	66
1918	46	24	63	35	75	47	64	48	85	61	93	71
1919	55	30	61	30	68	38	75	45	79	59	88	68
1920	56	36	55	37	63	42	71	52	82	63	88	67
1921	60	39	62	39	75	52	77	51	83	59	94	69
1922	55	36	61	42	66	45	78	54	85	61	91	65
1923	60	40	54	37	64	41	71	51	76	58	88	64
1924	53	28	59	36	62	39	75	53	81	56	94	69
1925	56	35	64	38	71	44	78	56	81	56	94	73
1926	54	33	64	38	60	38	72	45	83	57	90	65
1927	61	38	64	47	66	43	81	49	82	55	91	68
1928	58	36	61	37	69	46	74	48	83	60	88	67
1929	57	37	51	34	70	49	78	56	83	61	91	61
1930	53	34	67	43	64	43	79	54	83	63	92	66
1931	56	36	62	40	61	40	85	50	80	57	95	67
1932	63	42	70	48	64	40	79	54	82	59	93	69
1933	64	43	58	38	68	43	76	54	88	68	94	68
1934	61	39	57	33	69	42	79	53	84	60	93	70
1935	57	39	60	39	75	51	75	54	83	62	89	67
1936	52	32	53	29	74	48	76	49	86	61	98	69
1937	62	45	57	37	60	40	76	53	85	63	92	69
1938	58	34	68	44	76	53	76	53	86	62	90	67
1939	62	38	79	40	72	47	74	52	83	60	90	67
1940	41	20	54	34	67	43	74	51	80	56	86	66
1941	59	35	52	33	60	38	77	55	86	60	91	67
1942	55	30	52	34	66	44	78	52	83	59	89	68
1943	58.4	35	63.1	39.2	63.5	40.8	77.3	51.9	86.6	63.7	93.7	71.5
1944	55	36	61	44	67	45	72.4	51	83	61	93.8	69.6
1945	54	35.7	60.4	40.8	74.9	52.9	76.8	54.1	80.3	57.8	90.1	67.5
1946	54.6	37.4	64.1	38.3	71.1	50.3	79	55.5	78.9	59.8	86.2	66.3
1947	57.5	38.5	54.3	26.6	59.1	37.1	75.6	53.7	81.5	57.4	87.4	66.1
1948	48.5	28.7	572	38.6	67.9	47.5	79.2	56.1	84.9	59.7	92.7	68.3
1949	62.9	44.3	61.3	43.2	66.6	44.9	72.6	52.3	84.2	61.6	87.4	68.8
1950	68.1	48.4	65	41.3	65.2	41.6	72.2	47.2	84.2	66.7	87.6	68.1
1951	58.2	35.6	60.1	36.6	67.3	46.6	73.6	50.0	84.4	58.4	88.3	69.0
1952	63.3	44.2	62.8	43.6	65.8	43.0	73.4	49.3	84.1	59.8	95.9	70.8
1953	59.8	39.9	61.1	38.7	70.7	48.5	74.1	49.1	83.5	64.1	95.1	71.9
1954	57.8	36.6	67.8	41.6	67.9	43.4	79.6	56.7	77.7	56.0	93.4	68.2
Ave.	57.1	36.2	60.2	37.9	67.1	44.1	75.5	51.8	83.1	59.7	90.7	67.7

Temperature records at State College, 1910-1954.

July		August		September		October		November		December		
e. x.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Ave. Max.	Ave. Min.	Year
	68	93	68	94	65	81	54	65	41	54	32	1910
	70	89	69	95	68	78	53	63	37	58	38	1911
	70	90	68	88	66	79	55	66	37	54	38	1912
	72	96	71	85	64	76	52	71	47	55	38	1913
	72	91	71	87	64	77	56	67	42	48	34	1914
	68	90	69	89	66	79	56	68	45	57	38	1915
	73	91	69	86	59	81	52	62	40	59	37	1916
	66	88	68	82	64	76	46	65	41	50	30	1917
	69	95	70	84	58	76	57	63	38	61	30	1918
	70	91	71	88	64	83	63	67	46	57	38	1919
	70	89	68	87	66	81	54	60	40	55	36	1920
	72	94	73	96	71	79	50	73	47	63	41	1921
	69	92	67	90	65	72	53	65	45	60	43	1922
	68	92	69	90	64	75	51	66	41	62	42	1923
	67	97	70	85	60	81	51	71	43	56	35	1924
	70	95	70	95	70	74	52	63	41	55	32	1925
	67	92	70	93	66			61	30	61	36	1926
	71	95	69	93	60	84	55	71	49	59	34	1927
	71	93	71	86	61	84	57	65	43	58	36	1928
	69	94	68	86	65	76	54	60	44	58	36	1929
	72	94	69	89	66	74	52	65	45	54	35	1930
	71	89	68	91	67	83	56	74	49	63	45	1931
	73	94	71	85	64	76	51	62	41	56	37	1932
	71	92	69	93	69	80	53	70	45	67	45	1933
	73	96	73	89	63	81	56	70	47	57	37	1934
	72	98	72	92	65	83	57	65	45	51	30	1935
	72	96	71	95	72	78	53	59	41	60	45	1936
	69	92	72	82	62	68	49	60	42	55	35	1937
	72	95	72	91	67	84	46	70	38	57	37	1938
	71	91	69	90	66	81	53	64	38	64	38	1939
	69	89	68	86	59	80	50	65	41	61	41	1940
	70	90	69	89	65	81	60	64	40	59	39	1941
	72	90	69	86	62	80	52	71	47	57	38	1942
7	71.7	96	71	83	61	75	49	64	37	54.4	34.7	1943
6	68.1	89.9	70	86.4	64.1	79.5	49.7	64.6	44.6	53.6	34	1944
2	69	91.8	68.4	89.8	66.3	75.8	51.3	68.1	46.2	49.7	32.2	1945
7	70.3	87.9	67	84.1	62.5	79	50.8	69.3	48	62.5	38.2	1946
9	65.2	93.4	70	88.8	65	82.5	58.7	61.8	43.4	59.3	37.1	1947
4	72.1	90.3	68.9	82.7	62.5	76.4	48.5	65.6	46.3	59.8	41	1948
4	71.9	89.2	69.2	83	62.1	76.9	59.1	67.9	40.4	60.6	37.4	1949
8	68.5	87	66.6	81.1	64	78.9	55.7	62.1	37	51	31.3	1950
5	71.0	95.6	71.1	88.0	65.0	79.6	54.1	61.8	37.0	62.5	40.2	1951
9	70.6	93.4	68.6	86.4	60.3	73.3	43.8	64.9	41.7	56.6	36.9	1952
9	71.2	92.1	68.9	89.5	61.5	82.0	51.8	67.1	40.1	54.0	34.7	1953
7	72.7	99.2	72.8	93.8	65.6	79.5	54.4	65.0	41.2	56.6	35.1	1954
2	70.3	92.4	69.6	88.3	64.3	76.9	51.9	65.7	4.22	57.4	36.9	Ave.

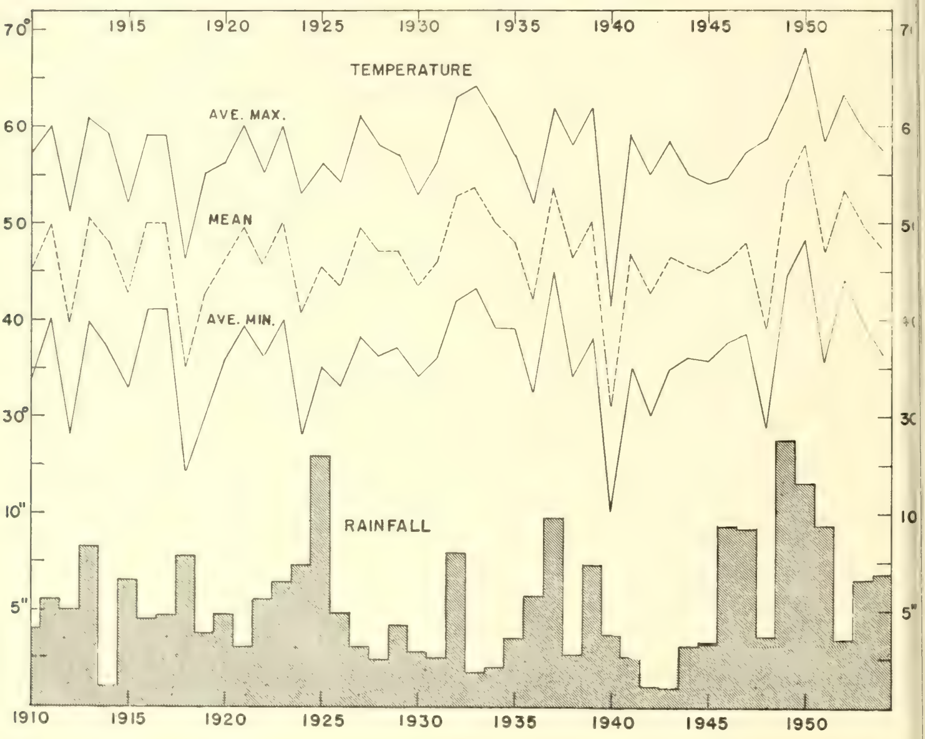
Rainfall by months at State College, Mississippi, 1889-1954.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1889	6.17	2.47	4.63	4.18	1.55	6.80	7.72	4.03	1.24	.70	4.18	.77	44.44
1890	3.62	8.03	7.97	5.46	4.35	3.20	3.47	5.83	6.74	3.90	.01	2.47	55.05
1891	7.64	8.50	9.84	3.88	1.78	5.69	8.68	1.30	.70	T*	7.74	5.42	61.17
1892	6.65	1.57	5.49	9.75	2.06	5.07	13.39	5.88	1.94	T	3.65	4.43	59.88
1893	2.06	5.11	2.56	1.87	7.11	1.25	2.28	2.89	8.34	.54	2.99	3.17	40.17
1894	5.01	4.73	6.79	3.13	2.40	2.57	4.88	6.76	1.68	.75	.16	4.11	42.97
1895	8.68	1.75	8.03	2.63	1.81	5.42	2.54	4.71	2.06	2.72	1.71	5.43	47.49
1896	4.15	9.31	4.52	4.21	4.44	4.48	2.60	1.47	1.03	2.61	4 38	1.00	44.20
1897	4.41	4.04	6.76	2.41	1.26	1.93	4.75	3.59	T	2.55	.72	12.72	45.14
1898	7.87	1.73	4.95	4.58	4.17	2.46	4.32	6.66	6.95	2.45	5.00	2.20	53.34
1899	8.37	8.99	8.84	1.50	4.93	1.82	4.56	3.85	.15	1.10	3.91	7.43	55.45
1900	3.10	5.90	6.85	11.90	3.88	14.39	6.22	.83	.63	8.06	1.18	3.15	66.09
1901	6.60	5.63	3.20	4.94	3.87	3.75	.60	8.16	2.35	1.25	4.00	5.32	49.67
1902	4.07	5.68	15.34	3.11	1.48	1.93	3.91	1.17	2.67	2.16	4.79	7.07	53.38
1903	4.64	8.62	4.63	.45	8.33	2.36	4.80	3.35	T	1.26	.15	2.35	40.94
1904	3.23	1.88	5.49	1.40	3.22	1.77	3.02	1.85	1.50	.05	3.70	4.80	31.91
1905	6.13	6.75	6.98	7.58	4.40	6.12	3.95	6.46	1.78	4.50	1.85	4.50	61.00
1906	3.15	2.05	6.75	1.20	4.33	1.45	3.20	1.09	8.87	3.01	3.40	4.33	42.83
1907	2.85	5.91	2.62	5.56	9.06	2.15	2.72	3.21	3.14	1.17	4.63	2.83	45.85
1908	4.32	7.35	4.12	2.61	6.50	4.84	5.04	2.99	T	.27	.68	7.94	46.66
1909	1.54	6.47	12.68	6.49	10.29	7.71	3.25	1.87	2.78	.65	1.40	4.72	59.85
1910	4.07	3.70	.93	3.02	2.62	4.49	8.67	1.42	.85	2.76	1.93	3.00	37.46
1911	5.52	3.75	1.45	10.07	1.92	5.88	6.24	5.10	.20	1.28	4.28	11.83	57.52
1912	5.00	3.11	8.86	12.90	4.68	6.87	6.77	7.47	5.05	5.60	1.00	8.96	76.27
1913	7.74	7.80	6.11	2.53	4.12	1.77	3.98	2.09	7.93	2.71	2.63	3.72	53.13
1914	1.05	4.22	7.19	5.46	2.15	5.06	.85	7.32	7.10	2.00	3.00	6.47	51.87
1915	6.60	4.47	2.81	.73	8.36	9.17	6.31	3.97	6.26	2.23	5.65	4.92	61.48
1916	4.55	2.28	2.85	3.47	7.02	4.02	12.63	2.58	.55	.82	1.96	2.47	45.20
1917	4.74	6.89	7.76	3.52	1.90	2.83	5.49	5.72	2.71	.59	2.41	1.68	46.24
1918	7.73	3.03	1.17	8.13	1.97	4.74	2.95	1.16	3.97	10.76	3.89	2.47	51.97
1919	3.85	5.52	6.23	4.09	5.33	7.15	3.44	7.67	1.48	4.31	8.41	5.14	62.62
1920	4.81	1.80	12.14	10.53	6.31	4.73	2.38	4.78	4.45	.00	2.54	6.74	61.21

1921	3.07	5.63	8.97	7.14	.40	2.47	3.50	2.55	2.99	1.22	1.80	3.49	43.23
1922	5.53	6.87	10.66	5.68	3.96	3.01	1.32	3.07	.40	2.21	4.03	6.32	53.06
1923	6.48	4.96	6.91	7.18	7.97	5.42	4.02	7.45	1.20	4.49	4.38	6.15	66.61
1924	7.31	3.98	6.54	8.17	5.82	.87	1.05	2.68	1.29	.21	.00	4.61	42.53
1925	12.90	3.18	5.14	3.18	2.80	1.61	2.46	1.77	2.38	7.52	5.78	3.31	52.03
1926	4.87	3.20	4.88	2.80	6.41	9.44	4.83	9.05	.15	1.74	5.64	12.65	65.66
1927	3.08	2.56	7.68	1.86	4.66	2.48	5.64	1.47	.83	1.57	6.11	7.91	45.85
1928	2.41	3.29	7.32	12.52	5.23	10.53	5.71	2.70	.88	1.66	3.47	1.89	57.61
1929	4.22	3.76	10.23	4.58	4.01	3.80	1.85	1.55	5.57	6.07	8.61	3.06	57.31
1930	2.85	2.81	6.49	1.26	9.16	.33	.62	4.48	4.27	2.76	4.67	3.57	43.27
1931	2.58	2.75	3.95	2.71	2.45	2.54	14.14	2.31	1.21	3.47	4.29	7.23	49.63
1932	7.92	6.70	3.88	2.42	3.29	1.97	3.35	2.63	7.07	7.81	3.03	12.01	62.08
1933	1.72	3.81	5.61	4.52	2.02	.84	6.21	5.98	2.34	1.53	2.23	1.77	38.58
1934	2.01	3.51	7.31	3.20	3.24	3.45	2.49	1.69	3.24	5.04	6.85	3.81	45.84
1935	3.55	2.41	8.06	5.26	4.01	2.85	.84	1.15	1.05	3.35	2.82	6.59	41.94
1936	5.67	4.46	2.74	2.46	1.54	.84	4.52	3.36	1.59	.78	2.39	4.90	35.25
1937	9.74	4.37	3.26	6.84	4.40	2.69	3.37	5.83	2.76	4.40	2.57	2.90	53.13
1938	2.68	3.03	7.37	4.32	2.11	3.32	6.63	2.90	.18	.27	3.60	2.53	38.94
1939	7.39	9.51	4.23	3.19	5.17	6.29	6.39	1.25	2.98	.21	.92	3.82	51.35
1940	3.67	6.57	4.92	3.05	4.52	7.46	16.00	5.52	3.55	1.06	4.16	5.82	66.30
1941	2.53	2.51	5.06	1.20	.22	1.31	11.42	4.45	1.40	4.13	4.02	3.84	42.09
1942	1.03	3.70	4.73	0.82	2.00	4.27	.83	2.91	1.96	2.46	.60	6.07	31.38
1943	.96	3.29	6.32	1.82	2.88	.93	2.39	3.54	4.74	.45	3.11	3.24	33.67
1944	3.15	6.78	9.25	6.87	4.28	.58	6.69	4.40	1.44	.04	3.96	6.54	53.98
1945	3.37	8.80	6.21	4.50	2.89	1.56	4.57	.70	2.27	4.39	3.17	5.10	47.53
1946	9.25	8.98	6.06	1.86	7.32	4.77	6.82	.77	1.38	2.37	6.64	4.17	60.39
1947	9.12	1.81	4.10	6.30	1.66	10.03	3.72	4.00	1.30	2.38	6.38	4.56	55.36
1948	3.63	7.94	7.51	5.26	1.08	2.21	3.06	4.90	7.05	0.18	11.20	4.52	58.54
1949	13.85	5.84	5.84	3.96	6.17	4.96	3.68	3.25	2.89	3.92	.63	4.02	59.01
1950	11.51	7.79	6.69	1.95	4.50	2.41	8.51	9.53	6.86	2.01	3.01	2.60	67.37
1951	9.33	4.41	13.52	4.08	4.47	5.93	3.15	3.25	3.40	0.99	2.71	8.19	63.43
1952	3.50	3.09	5.45	2.27	3.20	0.29	2.06	2.74	1.21	0.26	2.70	4.55	31.32
1953	6.55	7.31	3.65	6.57	6.29	2.59	5.26	1.82	.72	.77	0.42	6.63	48.58
1954	6.90	2.34	3.48	3.40	3.71	0.81	3.75	1.87	1.23	2.33	4.52	5.74	40.08
Ave.	5.22	4.86	6.22	4.49	4.11	3.92	4.80	3.71	2.71	2.38	3.46	4.97	50.84

*T, trace too small to measure.

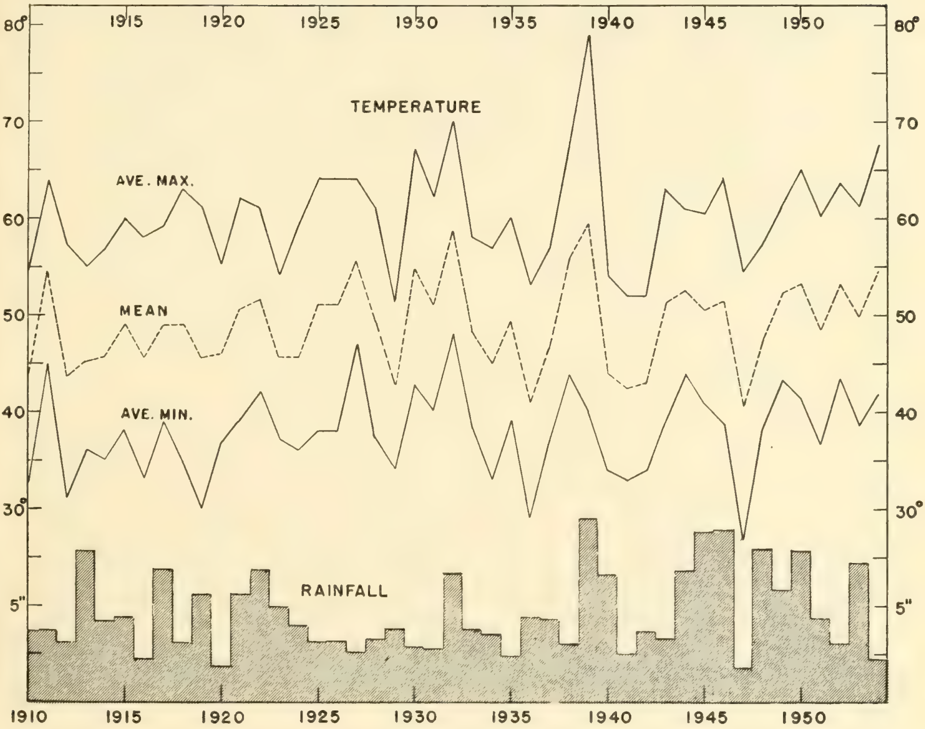
JANUARY



January is the coldest month of the year, although the average temperature is less than one degree below that of December. The graph reveals that 1940 produced the coldest January on record. The mean temperature for the month was 30.5 degrees, 16.2 degrees below the normal mean of 46.7 degrees. The warmest January on record occurred in 1950 with a mean of 58.3 degrees, 11.6 degrees above the normal.

The range of monthly precipitation varied from .96 inches in 1943 to 13.85 inches in 1949. The 66-year average for January is 5.22 inches.

FEBRUARY

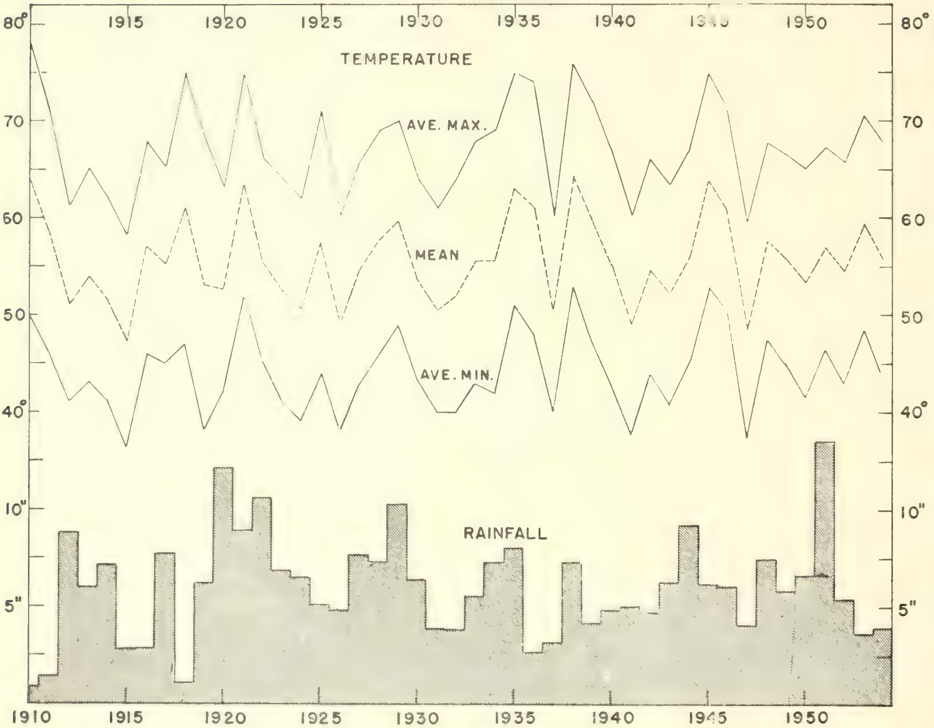


The average temperature of February is about two degrees above that of December. The graph shows that 1947 produced the coldest February on record. The mean temperature for the month was 40.5 degrees, 8.6 degrees below the normal mean of 49.1 degrees. The warmest February occurred in 1939 with a mean of 59.5 degrees, 10.4 degrees above the normal.

The range of monthly precipitation varied from 1.80* inches in 1920 to 9.51 inches in 1939. The 66-year average for February is 4.86 inches.

*1.57 inches in 1892. not shown on graph
1.75 inches in 1895, not shown on graph
1.73 inches in 1898, not shown on graph

MARCH

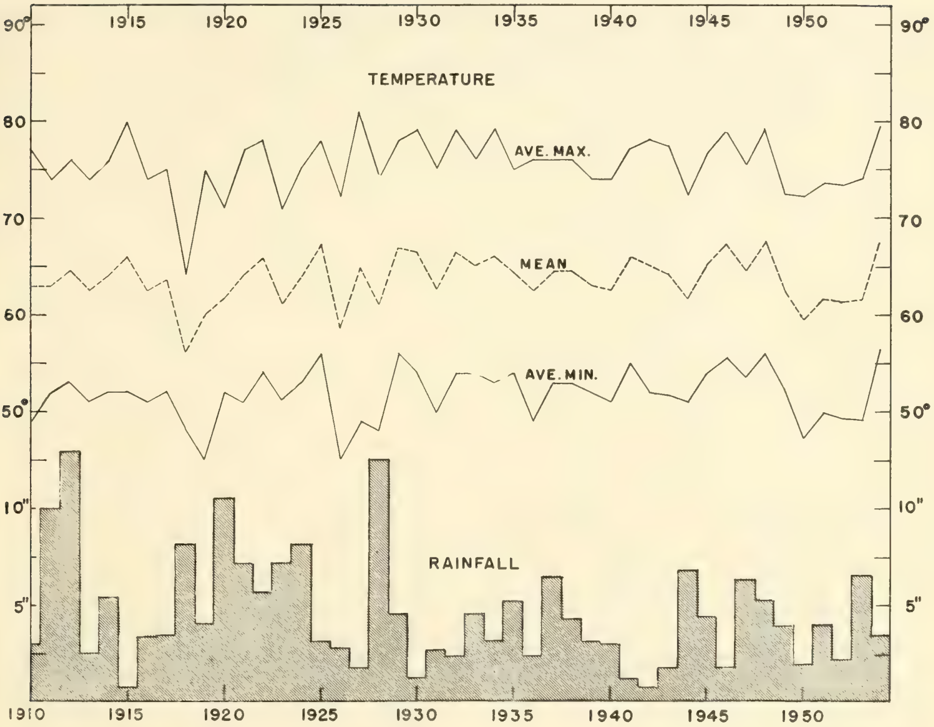


There is a rather pronounced rise in temperatures in March with the average being about 6.5 degrees above that of February. The graph shows that 1915 produced the coldest March temperatures on record. The mean temperature for the month was 47 degrees, 8.6 degrees below the normal mean of 55.6. The warmest March occurred in 1938 with a mean of 64.5 degrees, 8.9 degrees above the normal.

The range of monthly precipitation varied from .93 inches in 1910 to 13.52* inches in 1951. The 66-year average for March is 6.22 inches which is the highest average for any month.

*15.34 inches in 1902, not shown on graph

APRIL

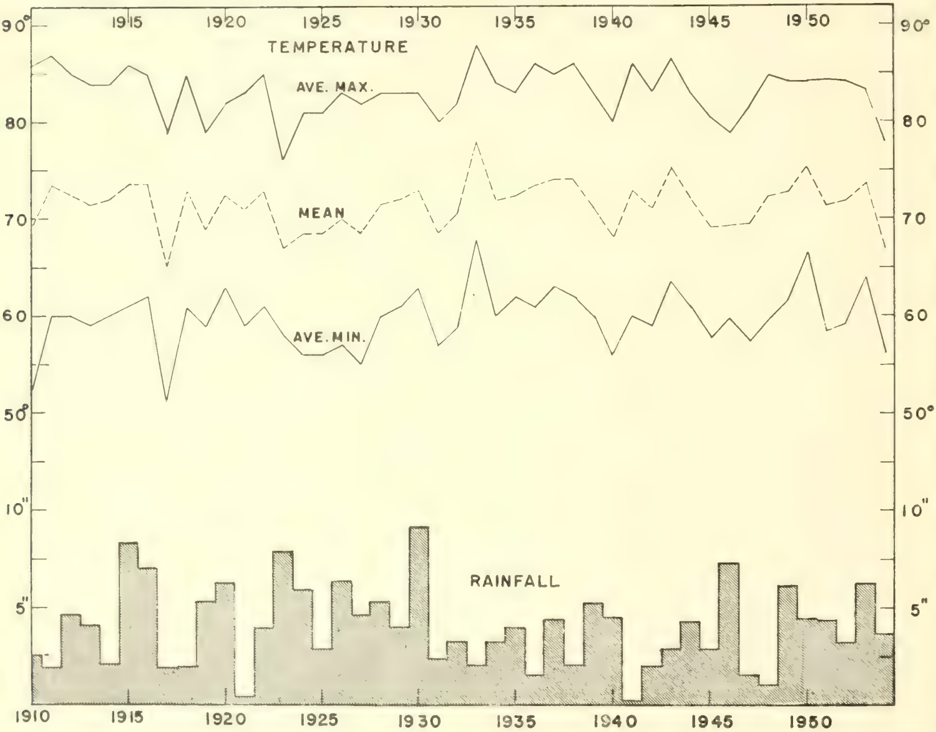


Normally, April brings a very decided increase in temperatures resulting in an average temperature of slightly over 8 degrees above that of March. The graph shows that 1918 produced the coldest April on record. The mean temperatures for the month was 56 degrees, 7.7 degrees below the normal mean of 63.7 degrees. The warmest April occurred in 1954 with a mean of 68.2 degrees, 4.5 degrees above normal.

The range of monthly precipitation varied from .73* inches in 1915 to 12.90 inches in 1912. The 66-year average for April is 4.49 inches.

*.45 inches in 1903, not shown on graph

MAY

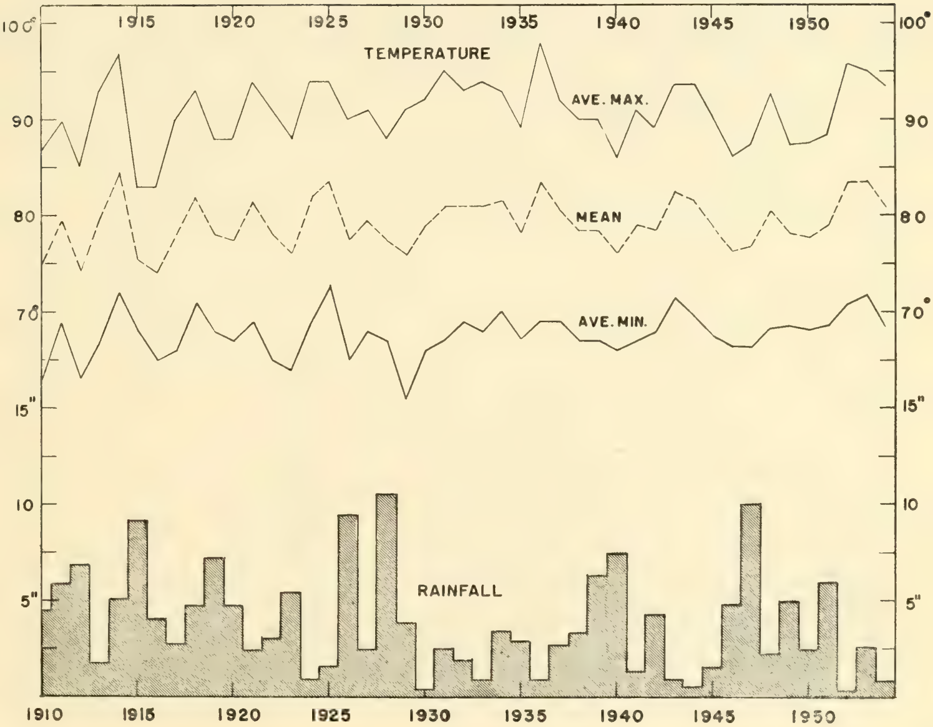


Temperatures continue to rise rather rapidly during May, being about 7.7 degrees above the average of April. The graph reveals that 1917 produced the coldest May on record. The mean temperatures for that month was 65 degrees, 6.4 degrees below the normal mean of 71.4 degrees. The second coldest May on record occurred in 1954 with a mean of 66.9 degrees. The warmest May occurred in 1933 with a mean temperature of 78 degrees, 6.6 degrees above normal.

The range of monthly precipitation varied from .22 inches in 1941 to 9.16* inches in 1930. The 66-year average for May is 4.11 inches.

*10.29 inches in 1909, not shown on graph

JUNE

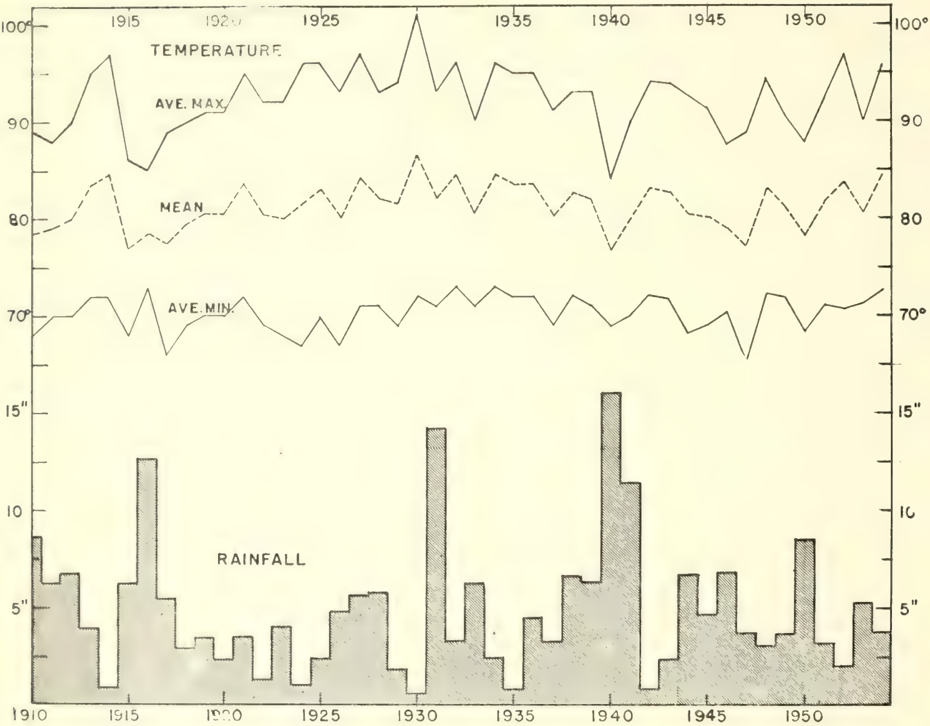


Average June temperature is about 7.8 degrees above that of May. The graph shows 1912 and 1916 to be the years in which the coolest June temperatures on record were recorded. The mean temperature for these months was 74 degrees, 5.2 degrees below the normal mean of 79.2 degrees. The warmest June occurred in 1914 when the mean was 84.5 degrees, 5.3 degrees above normal.

The range of monthly precipitation varied from .29 inches in 1952 to 10.53* inches in 1928. The 66-year average for June is 3.92 inches.

*14.39 inches in 1900, not shown on graph

JULY

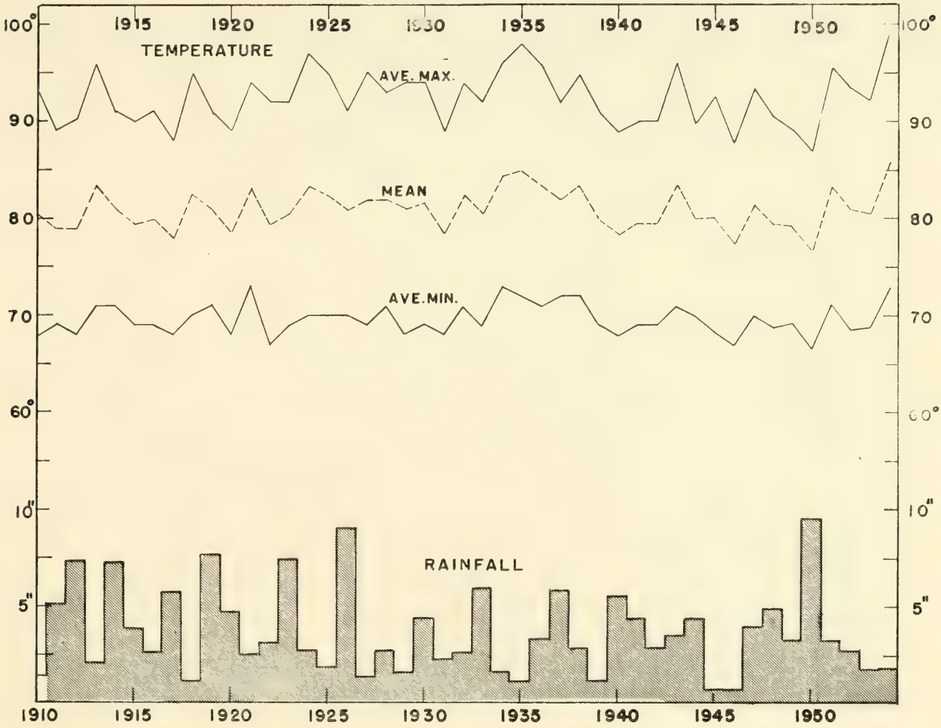


July is the hottest month of the year; however, the average temperature is less than a half degree above that of August and about 2.1 degrees above that of June. The graph for July reveals 1940 to be the year in which the coolest July occurred. The mean temperature for the month was 76.5 degrees, 4.8 degrees below the normal mean of 81.3 degrees. The hottest July occurred in 1930 when the mean was 86.5 degrees, 5.2 degrees above the normal mean.

The monthly precipitation for July varied from .62* inches in 1930 to 16 inches in 1940. The 66-year average is 4.80 inches.

*.60 inches in 1901, not shown on graph

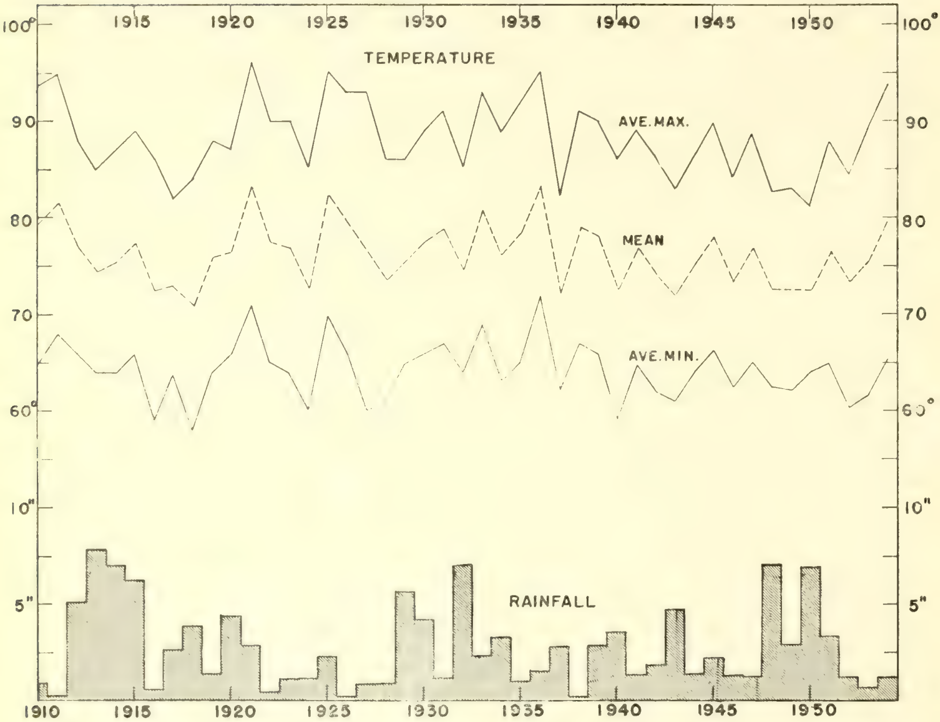
AUGUST



The average August temperature is slightly below that of July. The August graph shows that 1950 produced the coolest August temperatures on record. The mean temperature was 76.8 degrees, 4.2 degrees below the normal mean of 81.0 degrees. The hottest August occurred in 1954 when the mean was 86 degrees, 5 degrees above the normal mean.

The monthly precipitation for August varied from .70 inches in 1945 to 9.53 inches in 1950. The 66-year average is 3.71 inches.

SEPTEMBER



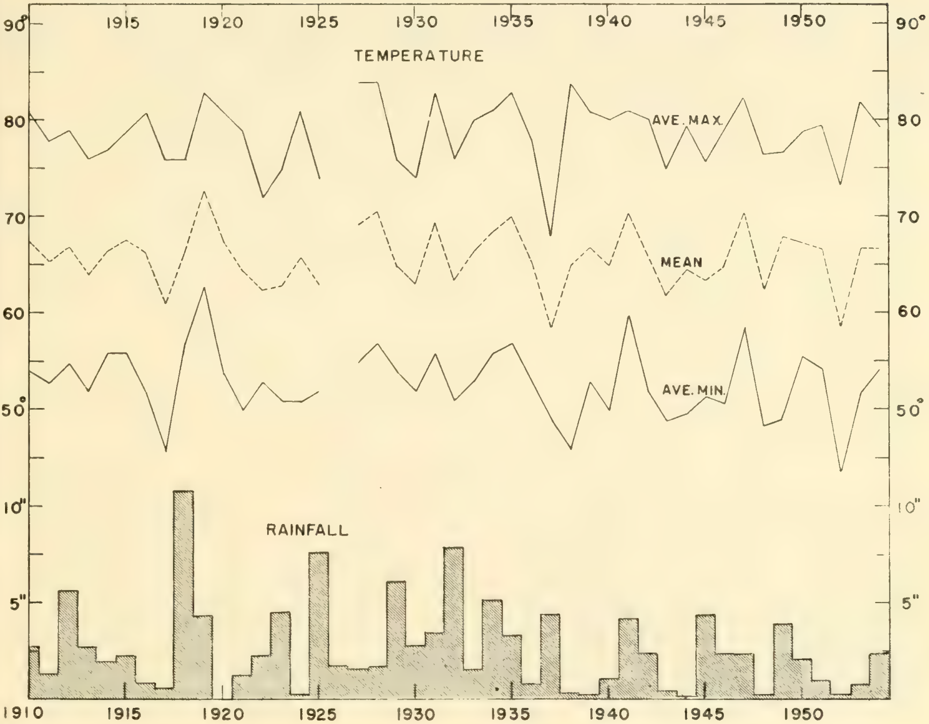
The temperature begins to recede during September. The average temperature is about 4.7 degrees below that of August. The graph reveals that the coldest September on record occurred in 1918 when the mean temperature was 71 degrees, 5.3 degrees below the normal of 76.3 degrees. The hottest September temperatures were produced in 1921 and 1936 when the mean temperature was 83.5 degrees. 7.2 degrees above normal.

The monthly precipitation for September, as shown by the graphs, has varied from .15* inches in 1926 to 7.93**inches in 1913. The 66-year average for September is 2.71 inches.

*Only a trace of precipitation was noted in September 1897, 1903, and 1908; and .15 inches in 1899, not shown on graph.

**8.34 inches in 1893 and 8.87 inches in 1906, not shown on graph.

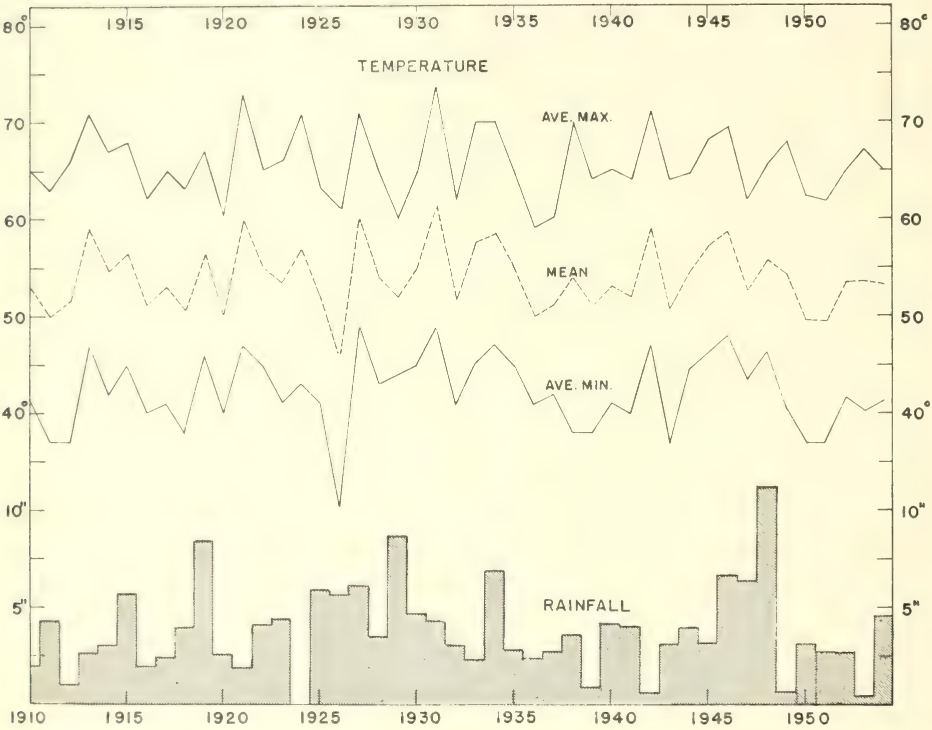
OCTOBER



There is a very decided decline in temperature during October. The average is about 11.9 degrees below that of September. The graph shows 1937 and 1952 to be the years in which coolest October temperatures occurred. The mean for each month was 58.5 degrees, 5.9 degrees below the normal mean of 64.4 degrees. The warmest October on record occurred in 1919 when the mean temperature was 73 degrees, 8.6 degrees above normal. The broken lines indicate that temperature records for October 1926 are not available.

The monthly precipitation varied from zero in 1920 to 10.76 inches in 1918. The 66-year average for October is 2.38 inches which is the lowest average for any month.

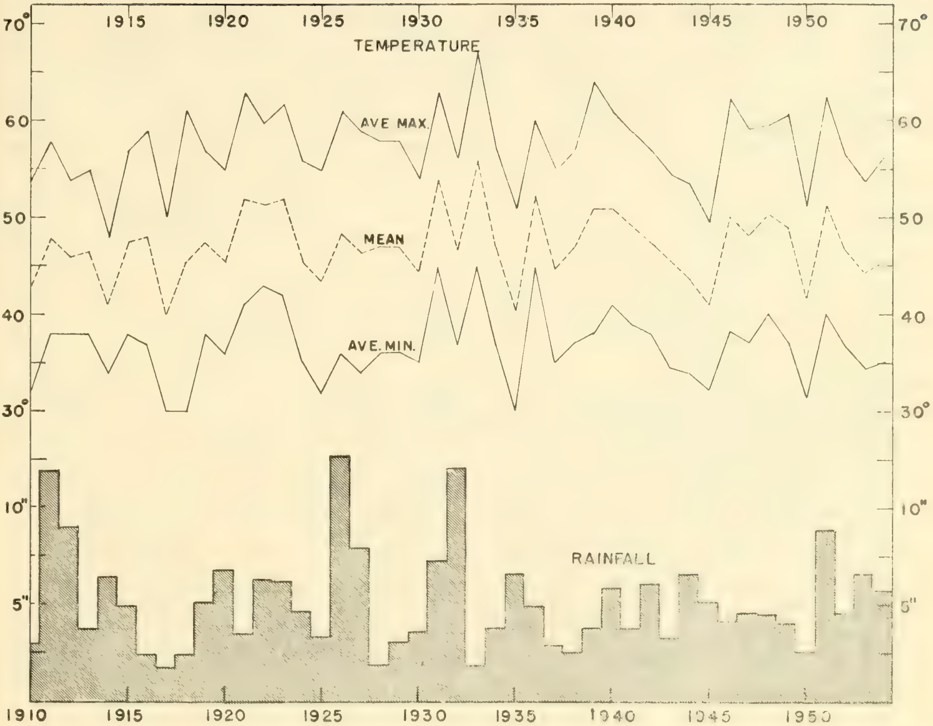
NOVEMBER



The temperature continues to decline rapidly during November with the average being about 10.4 degrees below that of October. The graph reveals that the coldest November on record occurred in 1926 when the mean temperature for the month was 45.5 degrees, 8.5 degrees below the normal of 54 degrees. The warmest November was in 1931 when the mean temperature was 61.5 degrees, 7.5 degrees above normal.

Monthly precipitation varied from zero in 1924 to 11.2 inches in 1948. The 66 year average for November is 3.46 inches.

DECEMBER

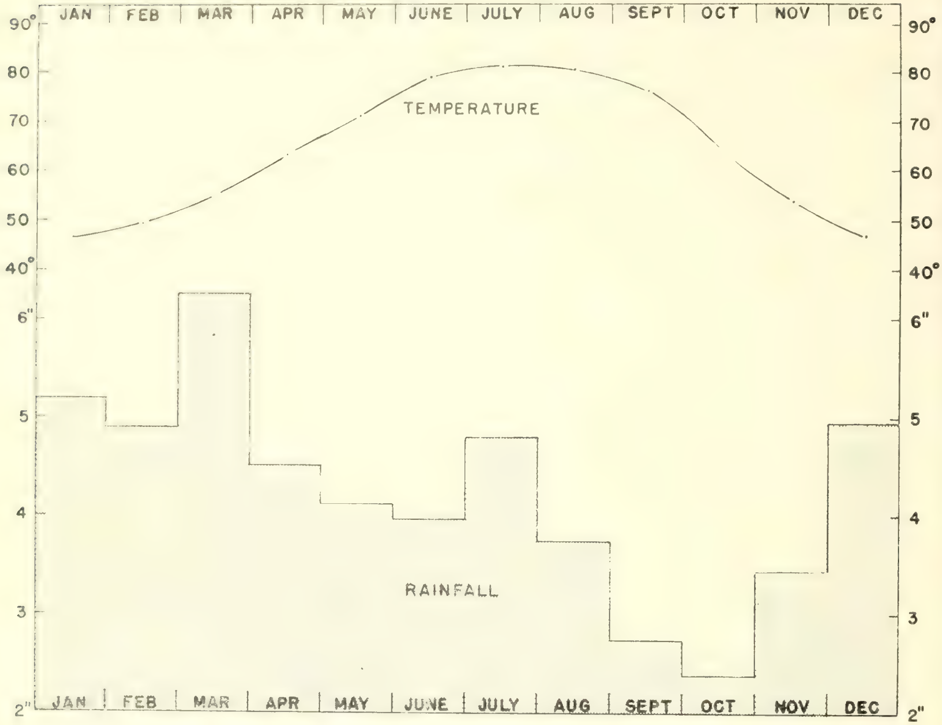


The average December temperature is about 6.8 degrees below that of November and about a half degree above that of January. The graph shows that the year 1917 produced the coldest December temperatures on record. The mean temperature for this month was 40 degrees, 7.2 degrees below the normal of 47.2 degrees. The warmest December temperatures were produced in 1933 when the mean temperature was 56 degrees, 8.8 degrees above normal.

The monthly precipitation varied from 1.68* inches in 1917 to 12.65** inches in 1926. The 66-year average for December is 4.97 inches.

*.77 inches in 1889 and 1.00 inch 1896, not shown on graph
**12.72 inches in 1897, not shown on graph.

SUMMARY FOR AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION



The curve in this graph represents the 45-year average temperature for each month. The vertical graph represents the 66-year average precipitation by months.

Average monthly temperature and precipitation.

Month	Temperature* in degrees Max.	Min.	Mean	Precipitation** in inches
January	57.1	36.2	46.7	5.22
February	60.2	37.9	49.1	4.86
March	67.1	44.1	55.6	6.22
April	75.5	51.8	63.7	4.49
May	83.1	59.7	71.4	4.11
June	90.7	67.7	79.2	3.92
July	92.2	70.3	81.3	4.80
August	92.4	69.6	81.0	3.71
September	88.3	64.3	76.3	2.71
October	76.9	51.9	64.4	2.38
November	65.7	42.2	54.0	3.46
December	57.4	36.9	47.2	4.97
Average	75.5	52.7	64.1	50.84

*45-year average.

**66-year average.

BULLETIN 531 MAY, 1955

Crop Response to
IRRIGATION
In the Yazoo-Mississippi Delta

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

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DELTA IRRIGATION SUMMARY

1. On sandy loam soils, during the 1952-54 periods, irrigation increased the yield of cotton an average of approximately 750 pounds of seed cotton per acre, increased corn yields 26 bushels per acre, and increased soybean yields 8 bushels per acre.

2. On clay soils, irrigation increased corn yields 30 bushels per acre, increased soybean yields 10 bushels per acre, increased alfalfa yields 1½ tons per acre, and failed to increase cotton yields in 1954, under the conditions tested.

3. Irrigated Dallis, Johnson, and Coastal Bermuda grass pastures produced over 300 pounds of beef cattle per acre in the period from July 26 to November of 1954.

4. On a hardpan soil, there was very little benefit from irrigating cotton.

5. Where cotton and corn were allowed to wilt severely before applying water, the yields response varied from a reduction to a slight increase and it was apparent that water must be applied earlier for practical benefits..

6. Insect control was more difficult on irrigated cotton than on non-irrigated cotton.

7. Irrigation increased the grass and weed problem.

8. The fiber of irrigated cotton was longer and weaker than non-irrigated. Irrigation corrected deficiences created by drought but apparently had no other effect on the fiber properties.

9. Irrigation had no significant influence on nep count, yarn strength, or other spinning qualities of cotton.

10. A permanent place for irrigation in agricultural production in the Yazoo-Mississippi Delta is indicated by the weather records and the crop response data.

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CROP RESPONSE TO IRRIGATION IN THE YAZOO-MISSISSIPPI DELTA

By PERRIN GRISSOM,[1] W. A. RANEY,[2] and PETER HOGG[3]

The purpose of irrigation is to keep the soil supplied with readily available moisture for plant growth and development. In the Mississippi Delta area where the total rainfall normally exceeds the amount necessary for optimum crop production, the purpose of irrigation can be limited to correcting soil moisture deficiencies created by poor rainfall distribution, excessively high temperature, and poor moisture intake and storage conditions within the soil.

This bulletin reports the results of supplemental irrigation experiments conducted at the Delta Branch Experiment Station in the period 1952-54 and discusses some of the factors which affect the need for and response to artificially applied water.

Factors Affecting Crop Response to Irrigation

The response to irrigation is influenced by the crop, the climate, and by the soil on which the crop is grown. The degree of response varies from year to year because of differences in total rainfall and rainfall distribution. Within a given year, the rainfall distribution will have a greater influence on response to irrigation than the total annual rainfall. Table 1 shows the average monthly rainfall at eight locations in the Mississippi Delta, which will serve to illustrate the differences in rainfall distribution. There is little difference in the amount of rainfall in different parts of the Delta but there is considerable variation between months. The rainfall is lowest when the crop needs are greatest.

Crop needs for water are not constant throughout the growing season. For most crops, the needs increase to a maximum in late summer and then decrease in the fall. Crop needs can be considered as the amount of water that is lost by transpiration through the plant and by evaporation from the soil. The water requirement for optimum crop growth is lower on a cloudy day than on an extremely hot day with full sun. More water is required per day for a long period of high temperature than for a short period at the same temperature.

The amount of water that is needed for optimum plant growth where there are no other restrictions can be calculated. Table 2 shows these calculated values for eight locations in the Mississippi Delta. These data show very small differences between locations but do show marked differences during the growing season.

The annual rainfall exceeds the total crop needs, but the distribution of the rainfall does not coincide with crop needs. There is an excess of precipitation in the winter months when crop requirements are at a minimum. During the summer, however, there are frequently a number of days or even weeks during which crop needs for water far exceed rainfall.

Fortunately, the soil acts as a buffer to climate. During periods of excess rainfall, the soil can act as a reservoir and store water for use during those periods when crop requirements exceed rainfall.

Soil stores moisture because there is an attraction between the soil and water and not because the soil acts as a water-tight vessel. To be available to plants, the attraction between the soil and water must not exceed the attraction which plants themselves can exert. When the soil has just reached the moisture content below

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Table 1. Average monthly rainfall (inches) at 8 locations in the Mississippi Delta.

Location	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Clarksdale	4.04	4.18	5.56	4.73	4.89	3.77	3.24	3.36	2.62	2.87	4.01	5.62	48.89
Scott	4.35	3.99	4.65	4.83	5.12	3.18	3.66	3.09	2.92	2.96	3.96	5.65	48.36
Belzoni	5.29	4.19	5.13	4.19	4.34	3.12	3.43	2.11	1.99	2.31	4.43	5.86	46.39
Greenville	4.78	4.48	5.53	5.03	5.02	3.31	3.35	3.86	3.47	2.69	4.13	6.57	52.22
Greenwood	5.09	4.77	5.82	5.70	4.88	3.76	4.34	3.36	2.58	2.88	4.09	6.50	53.77
Moorhead	4.86	4.09	5.33	5.18	4.58	3.86	4.12	3.29	2.55	2.50	3.80	6.40	50.56
Stoneville	4.71	4.28	4.68	4.76	5.02	3.09	3.52	3.45	3.11	2.43	3.72	6.08	48.85
Yazoo City	5.16	4.68	5.90	5.29	4.61	3.59	4.46	4.08	2.54	2.66	3.61	5.75	52.33
Mean	4.79	4.33	5.33	4.96	4.81	3.46	3.77	3.32	2.72	2.66	3.97	6.05	50.14

Table 2. Calculated monthly water requirements for optimum plant growth (inches) at 8 locations in the Mississippi Delta.

Location	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Clarksdale	.35	.51	1.50	2.70	4.58	6.42	7.01	6.33	4.91	2.60	.97	.44
Scott	.42	.61	1.54	2.53	4.31	6.20	6.72	6.34	4.66	2.60	.97	.54
Belzoni	.45	.71	1.57	2.91	4.68	6.42	7.01	6.61	4.90	2.60	1.11	.54
Greenville	.45	.70	1.28	2.53	4.59	6.42	7.01	6.61	4.90	2.60	1.10	.44
Greenwood	.35	.64	1.54	2.70	4.59	6.42	7.01	6.61	4.83	2.60	1.10	.44
Moorhead	.45	.64	1.50	2.70	4.59	6.42	7.01	6.34	4.66	2.60	1.04	.51
Stoneville Exp. Sta.	.45	.64	1.50	2.70	4.59	6.19	7.01	6.34	4.90	2.60	1.04	.51
Yazoo City	.48	.64	1.87	2.96	4.68	6.40	6.61	6.53	4.86	2.63	1.07	.61
Mean	.43	.64	1.54	2.72	4.58	6.36	6.92	6.46	4.83	2.60	1.05	.50

which the water is unavailable to plants the soil is at the "permanent wilting percentage."

Soil moisture must also be retained against the force of gravity. Following a rain the soil remains moist after the downward movement of water has ceased. The term "field capacity" has thus been used to denote the moisture percentage that has thus been retained by soil against gravitational forces. The available water holding capacity is the difference between the amount that is retained against gravity and the amount that is retained at "permanent wilting percentage."

All soil moisture between "the permanent wilting percentage" and field capacity is not equally available to plants even though it is considered available water. As the soil moisture content decreases it becomes increasingly difficult for plants to obtain water from the soil. In general, best plant growth is obtained when the soil moisture reservoir is about half full. At this moisture level both adequate aeration and adequate moisture are assured.

Sandy soil has a low available water holding capacity. When it rains, very little of the water is retained. Clay soils, on the other hand, retain a large amount of water at field capacity. Even though clay soils retain an appreciable quantity of water at the "permanent wilting percentage," the amount of available water is greater in clay soil than in sandy soil.

Table 3 is a rough guide to the available water that can be stored by different textured soils per foot of depth.

Table 3. Average available moisture holding capacity of soils in inches per foot of soil.

Soil texture	Avaliable water inches per foot
Sandy soil	0.75
Sandy loam	1.30
Loam and silt loam	2.00
Clay loam and clay	2.00

The total profile storage capacity is the product of the available moisture holding capacity and the depth of the root zone. The capacity of the soil profile to store water largely determines whether or not that soil is considered droughty.

When the soil moisture reservoir is maintained one-fourth to three-fourths full at all times, there is a greater loss of moisture through evaporation and transpiration than when the soil is occasionally allowed to reach the "permanent wilting percentage." When an abundance of soil moisture is available during the period of maximum use, as much as .4 acre inches of water per day may be lost. The average daily requirement is nearer .2 acre inches. If the storage capacity of the soil is 2 acre inches, the soil can hold only enough water to last 10 days under average summer conditions.

By taking into consideration the soil storage capacity for water, the losses through evaporation and transpiration, and the rainfall distribution, it is possible to calculate the monthly water deficiency.

Table 4 shows that the average monthly water deficit in the Delta is influenced by the profile storage capacity during June and July. During August and September there is an average deficiency of 5.25 acre inches regardless of the storage capacity of the soils.

Certain vegetable crops are shallow rooted and will exhaust soil moisture reserves quickly within the limited area occupied by their roots. Supplemental irrigation is needed much more frequently than for deep rooted crops. Young plants require more frequent irrigation than old plants for the same reason. When the entire plant is to be harvested, the time of

Table 4. Average monthly water deficiency in Yazoo-Mississippi Delta (inches).

Available Moisture Storage Capacity	June	July	August	September
1	.90	3.16	3.14	2.11
2		3.06	3.14	2.11
3		2.06	3.14	2.11
4		1.06	3.14	2.11

irrigation may not be too important as long as adequate amounts of moisture are supplied. When the fruit of a crop, which depends upon the proper balance between vegetative growth and fruit set, is to be harvested, the timing of irrigation assumes much greater importance.

Moisture is generally critical during periods of fruit set and early growth of fruit. A drought between silking and tasseling of corn and the early milk stage of the kernels will severely decrease yield. A drought before or after this period will have less effect. These same trends hold for cereals and for cotton. The response to irrigation will be much greater during these critical periods.

Different crops are grown at different times of the year. A drought in September would not affect corn yield in most places, but a drought in September could severely hinder establishment of pastures.

Factors Affecting Time of Applying Water

Soil characteristics which affect intake, storage, availability, or removal of water have a direct influence on irrigation practices. Soils with a low intake rate are not capable of absorbing much of the rainfall. Such soils are difficult to irrigate. Irrigation water must be applied at a low rate over a long period of time, thereby increasing the cost of irrigation.

The size of the soil particles, their arrangement, and the slope of the land are major factors which affect the rate that water will be taken in. In general, the finer the soil particles and the steeper the slope, the slower the water intake rate. Sandy soils will absorb water more rapidly than silt or clay soils. An exception to this occurs in the Delta where clay soils crack when they dry out. These cracks permit rapid penetration of water until the soil reaches field capacity. After these soils reach field capacity, the absorption of water almost ceases.

Soils which have a compacted layer in the soil profile that restricts the movement of water and roots also have a low absorption rate. Eradication of such a hardpan increases the efficiency of an irrigation system and reduces cost.

Infiltration rates are usually measured by applying water to a plot at an excessive rate, measuring the runoff, and calculating the intake rate as the difference between the two. An alternate method is to measure the rate of application which, if exceeded, would produce runoff. The reliability of both of these methods increases with plot size. A small plot might, by chance, occur on an isolated spot with an extreme intake rate that would not represent the field as a whole. The method of applying water to the plot has an effect on the measured intake rate.

Measurement of intake rate should be made with the type of irrigation system that is to be used and at about the moisture content at which irrigation will occur. Even then, some adjustment in application rates during the growing season might be required. The beating action of water drops usually reduces intake rate. If a sprinkler irrigation system is used to apply water, the intake rate is less than where a furrow or border method is used. Neither method will exactly simulate rainfall. Infiltration rates are also influenced by soil moisture content, stability of structure, crop residue management, and soil cover.

Factors Affecting Time of Irrigation

Generally, it will prove practical to start irrigating when about 50 per cent of the available moisture has been used up. Under farm conditions, the time to irrigate may best be determined by observing the plants or by examining the soil. There is also a possibility of calculating the time that water should be applied.

Most plants undergo changes in plant appearance when less than 50 percent of available moisture remains in the soil. There may be slight wilting or changes in leaf color, leaf arch, or other changes which farmers may use as indicators after they have some experience with irri-

Table 5. Soil moisture as related to soil.

Available moisture remaining	Feel or appearance of soils		
	Sandy loam soil	Loam and silt loam	Clay loam and clay
0	Dry, loose, flows through fingers	Powder dry, sometimes slightly crusted but easily breaks down into powdery condition	Hard, baked, cracked, sometimes has loose crumbs on surface
50% or less (Begin irrigation)	Still appears to be dry, will not form a ball*	Somewhat crumbly but will hold together under pressure	Somewhat pliable, will ball under pressure*. Cracks appear
50% to 75%	Tends to ball under pressure but seldom will hold together	Forms a ball* somewhat plastic, will sometimes slick with pressure	Forms a ball, will ribbon out between thumb and forefinger
75% to field capacity	Forms weak ball, breaks easily, will not slick	Forms a ball and is very pliable, slicks readily if relatively high in clay	Easily ribbons out between fingers and has a slick feeling
At field capacity	Upon squeezing no free water appears on soil but wet outline of ball is left on hand	Same as sandy loam	Same as sandy loam
Above field capacity	Free water will be released with kneading	Can squeeze out free water	Puddles and free water form on surface

*Ball is formed by squeezing a hand full of soil very firmly with fingers.

gation. Soil characteristics may also serve as a guide for the time to irrigate. The soil should be examined in the center of the root zone or at a depth of one foot, depending upon the extent of the root system. Table 5 lists some of the soil characteristics at different moisture levels.

Under most Mississippi conditions for most crops the time lapse between irrigations, where no rain occurs, can be expected to vary from ten to fifteen days. Crops with shallow root systems will probably require more frequent applications of water.

An approximation of the time to irrigate may be calculated from rainfall data and from water requirement data by a simple bookkeeping procedure. The credits are rainfall and irrigation water and debits are evaporation and transpiration. Table 6 illustrates the procedure where profile storage capacity is four acre inches of available water. Since irrigation should begin when one half of the available water is exhausted, a two-inch irrigation is added whenever the balance is down to two acre inches. Table 7 shows a deficit by this means of 18 acre inches of water during 1954. This procedure over-emphasizes water requirement for cotton early in the growing season and over-emphasizes requirement for corn in the late summer.

Weather Data

Tables 7, 8, and 9 report the daily rainfall, maximum and minimum temperatures for the period April 1 through September 30 for each of the three years, 1952-54, that irrigation tests have been conducted at the Delta Station. The information presented in these tables is helpful in interpreting the crop response data.

Cotton

In recent years, it has been evident

that cotton is less tolerant of drought than was generally believed. Curtailed yields due to moisture deficiencies have been the rule rather than the exception. The use of supplemental irrigation to correct these deficiencies has been studied at the Delta Station since 1951 and previously from 1928 to 1932. The studies have been fruitful but the close interrelationship between irrigation and other production practices such as drainage, fertilizers, weed control, deep tillage, and insect control, tend to make efficient irrigation of cotton a complex problem. It appears likely that adjustments will be required on all of these practices for best results. The manner in which the cotton plant responds to irrigation must be considered also. For maximum production a balance between vegetative growth and fruiting is desirable. Too much water or too little water may affect the balance adversely. This problem is more acute in this area than in cotton growing areas where rain is improbable. If the vegetative growth is promoted excessively by irrigation, and wet, cloudy weather follows, reduced yields may be expected. The Delfos 7343 variety of cotton was used in all of the tests reported in this bulletin.

When To Irrigate. The timing of the irrigation of cotton, with respect to the level of soil moisture and stage of plant development, will likely be the key to

Table 6. Calculated irrigation requirements when profile storage capacity is 4.00 acre inches (1954) Stoneville, Miss.

	Credits		Evaporation + Transpiration		
Dates	Rainfall	Irrigation	Debits	Balance	Runoff
	April		Inches		
1-7	0.53		.57	3.96	
8-15	1.18		.64	4.00	.50
16-23	2.42		.72	4.00	1.70
24-30	2.19		.79	4.00	1.40
	May				
1-7	6.79		.98	4.00	5.81
8-15	3.22		1.08	4.00	2.14
16-23	0.07		1.20	2.87	
24-31	1.22		1.32	2.77	
	June				
1-7	.00		1.42	1.35	
8-15	.00	2.00	1.51	0.49	
16-23	.21	4.00	1.60	3.10	
24-30	.45		1.63	1.92	
	July				
1-7	0.00	2.00	1.70	2.22	
8-15	0.00	2.00	1.75	2.47	
16-23	0.57	2.00	1.75	3.29	
24-31	0.82		1.72	2.39	
	August				
1-7	.05	2.00	1.69	2.75	
8-15	.00	2.00	1.65	3.10	
16-23	2.26		1.59	3.67	
24-31	.10		1.52	2.25	
	September				
1-7	0.00	2.00	1.44	2.81	
8-15	.13		1.33	1.61	
16-23	2.04		1.13	2.52	
24-30	.03		.93	1.61	

Table 7. Weather data at Delta Branch Experiment Station, April-September, 1952

Day	April			May			June			July			August			September		
	(in.) Rain	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.
1		71	56		91	55		90	60		99	73		95	71		98	72
2		68	45		92	60		91	62	T	97	73		96	70	.65	86	60
3		70	43	.01	94	60		94	62		98	71		99	72		80	50
4	.46	65	56		93	61		95	69	.41	95	71		98	73		81	50
5	.06	59	40		95	62		93	70		95	72		97	73		87	52
6		61	37	T	94	66		93	68		98	67	.52	91	69		89	60
7		75	40	.02	93	69	T	95	67	T	97	71		91	67		91	58
8		80	53		91	66	.31	96	69		95	70	.08	93	68		94	64
9		81	53		90	64	T	95	72	.03	87	65	.17	91	72		93	61
10	.20	78	45	.53	86	60		93	74		91	60	.46	94	71		89	59
11		66	44		66	48		96	74		94	61		95	72		92	57
12	1.25	65	53		78	45		97	73		96	69		96	74	.05	89	63
13	T	59	49		81	48		98	69		96	69	T	97	73	.70	86	65
14		62	43		84	56		98	68		98	73		99	73	.03	87	68
15		64	39		86	62		98	69	T	96	72		99	75		90	65
16		67	40		86	60		97	70	.05	91	74		101	76		90	61
17		71	43		91	64		99	72	T	96	75		103	75		93	58
18		77	47	.34	87	64		101	74	T	96	70		97	71	.04	87	63
19		80	53	.05	67	56	1.11	101	73	T	96	71	T	97	72		84	64
20		75	58		77	59		94	75		96	73	T	100	72		87	56
21	.24	80	63		83	53		95	76		100	72		98	71		82	58
22	T	83	58	.14	88	62		95	73		100	70	T	95	74		81	58
23	1.74	77	64		88	63		96	74		102	71		92	72		83	51
24	.24	75	57	1.01	83	63		97	75		103	69		91	65		82	48
25		82	44		84	65		96	76	T	102	71		91	64		85	49
26		72	40		83	60		96	75		101	71		93	64		85	51
27		77	41		87	61		100	74	T	102	72		92	63		88	48
28		83	54		80	63	T	102	75		102	73		92	57		91	48
29		87	56	.53	73	61		99	74	T	101	77		92	60		90	51
30		90	58		81	55		98	73	1.29	91	69		94	62		90	55
31					86	54				T	92	72		99	65			

Table 8. Weather Data at Delta Branch Experiment Station, April-September, 1953

Day	April			May			June			July			August			September		
	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.
1	.03	78	53		83	56		96	69		96	74		93	71		98	65
2		74	49		86	59		91	65		95	75		93	72		96	70
3		77	44	.10	85	59		91	60		96	74	.09	93	71		94	67
4	.07	74	51	2.44	76	62		91	62		95	74		95	73	.74	97	69
5		76	45		70	58		93	69		96	75		98	72		81	56
6	.29	70	57	T	73	54		96	70		97	76	.35	94	74		86	54
7		72	48	.06	77	53	T	98	74		98	76		98	71		93	57
8		87	52		78	52		97	74	.01	92	75		97	73		91	59
9		88	66		84	56		98	75		95	75		92	65		92	56
10		84	55		86	61	.13	99	73		91	71		90	60		91	59
11		83	45	.26	84	64	T	100	72		87	60		92	60		93	62
12	.77	79	52	.72	85	63	T	99	72		85	64		96	63		98	65
13		62	40	.78	80	63		99	73		86	70		98	64		91	56
14		72	38	.73	77	53		98	76	.02	90	67		100	75		95	51
15	.13	73	54	1.36	66	55		97	76		89	66		94	70		94	62
16		72	40	.70	87	55		96	75	.47	87	69		96	71		96	60
17		79	42	1.10	82	68		99	76	T	88	69		94	70		98	59
18	.12	76	43	.04	81	65		99	77		92	69	.18	93	69		95	65
19		62	34	.27	81	63		101	75	T	93	72	T	87	70		90	57
20		61	38		85	63		100	72	.94	84	72		90	62	1.26	90	62
21		72	32		87	68	.84	102	69	.18	85	73	.26	90	63		84	61
22		81	50		90	72		98	71	.21	88	72	.27	84	70		77	50
23		84	60		91	71		97	73		91	70	T	82	67		83	47
24	1.77	78	60		92	71		96	73		91	69		87	61		87	54
25	T	77	59		90	69	.08	95	72		92	67		91	62		84	63
26		75	49		93	67		96	70		95	68		92	63		84	59
27		72	43		98	72	T	94	70		93	71		92	65		94	58
28		81	51		95	64	.34	85	72		95	69	.01	87	72		97	58
29	3.00	79	60		95	67		91	73		96	71	.41	91	71		96	55
30	.01	81	59		94	67		95	72		103	72		91	69		95	55
31					94	64					93	71		94	68			

Table 9. Weather data at Delta Branch Experiment Station, April-September, 1954

Day	April			May			June			July			August			September		
	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.	Rain (in.)	Temp. Max.	(°F) Min.
1		57	32	4.79	75	63		92	74		103	71		95	69		89	55
2		75	34		84	64		91	67		99	74		93	74		94	57
3		82	44	2.00	69	48		88	68		97	73		99	69		99	56
4		83	53		61	43		80	53		96	73		98	72		99	60
5		85	65		70	44		84	50		100	73		98	73		100	60
6		86	65		77	49		88	57	T	100	73		98	72		100	60
7		88	64	T	74	57		93	66		96	73	.05	98	72	T	96	71
8	.53	85	55		75	47		93	70		97	73		101	73	.09	94	64
9		76	45	.23	72	56		98	70	T	95	70		95	72	.04	97	64
10		74	60	.02	66	55		96	69		97	69		96	60		95	69
11	.60	79	63		71	54		97	67		98	64		102	67		82	58
12	.12	77	55		67	55		98	70		100	69		100	67		87	54
13	.37	69	54	2.97	69	54	T	95	68		99	74		99	67		94	49
14		87	56		73	50		94	69		98	76		100	67		97	57
15	.09	82	67		78	54		92	70		100	75		101	72		98	59
16	.86	69	52		81	53		91	72		104	75		102	74	T	95	63
17		77	43		83	58		93	71		97	74		100	74		89	68
18		80	50	.07	78	65	.17	94	70		99	75		99	71		95	69
19		80	51		81	60		94	69	T	98	70		94	72		97	70
20		83	54		73	50		93	67	.57	94	72		98	75		96	72
21		86	53		75	45		96	67		95	72	.78	93	69	2.04	79	65
22		85	59		82	50		97	70		96	75	1.48	94	67		77	—
23	1.56	86	57		85	54	.04	99	72		99	77		93	67		80	50
24		84	58		87	58		99	73		103	74	.10	95	71		90	52
25	T	84	60		84	63		101	70	.82	91	72		98	72		91	63
26		87	63	.40	82	66		100	75		93	69	T	98	72		94	66
27		85	63	.82	76	65		101	74	T	93	70		98	70		94	62
28	.27	82	—		87	63	T	103	75		93	67		100	73		91	65
29	1.92	85	64		88	67	.26	102	74	T	91	66		100	72	.03	91	71
30		85	69		93	66	.19	98	68	T	93	69		99	72		91	71
31					93	70					95	67		87	67			

successful irrigation. With this in mind, an experiment was begun in 1952 on a Dubbs fine sandy loam soil to study the effect of irrigating cotton at varying moisture levels.

The treatments used which will be referred to by number in the remainder of this discussion were as follows:

Treatment 1. No irrigation.

Treatment 2. Irrigation when the soil moisture reached the permanent wilting percentage, the soil was powdery dry, and cotton plants had wilted severely.

Treatment 3. Irrigation when soil moisture reached 50 percent of available capacity, soil appeared dry but would ball under pressure, and wilting occurred only in the afternoon.

Treatment 4. Irrigation when soil moisture had dropped to 75 percent of available capacity, soil was still moist, would ball up readily, no wilting to very slight wilting occurred.

In 1952 and 1953 special instruments, Bouyoucos blocks and tensiometers, were used to determine the soil moisture level. The variations within plots and between plots of similar treatment were so great that the reliability of the measurements was questioned. In 1954, plant appearance alone was used to determine the time for the various treatments. The water was applied by sprinkling with perforated pipe in 1952 and by the furrow method with gated pipe in 1953 and 1954. It should be pointed out that, due to the small plots and to the somewhat excessive rate of application, the efficiency of the water was probably lower than might be expected under farm conditions.

Table 10 presents a rather varied response to varying the frequency of irrigation. Some of this variation may be explained by the weather records. In 1952, on treatment No. 2 where the plants were severely wilted before applying irrigation water, the cotton was temporarily revived but was not sustained in that condition due to high temperatures and dry winds.

By August 18 the cotton was in a severely wilted condition and soil moisture measurements indicated the permanent wilting percentage had been reached again. As before, a vegetative response occurred but the temporary revival was inadequate to produce an increase in yield. In two other cases in 1952, one application of water to severely wilted cotton reduced the yields. In 1953, the cotton was planted nine days later than in 1952 thus making the peak moisture demands

Table 10. The influence of irrigation at different moisture levels on the yield of cotton on a Dubbs fine sandy loam soil, 1952-54.

Treatment	No. times irrigated	Total inches of water applied	Date of first irrigation	Date of last irrigation	Pounds of seed cotton per acre
			1952—Planted May 12		
1	0	0	0	0	2665
2	2	4	July 29	August 18	2590
3	5	10	June 25	August 14	3072
4	7	14	June 28	August 14	2954
			1953—Planted May 22		
1	0	0	--	--	3001
2	1	3	August 17	August 17	3542
3	3	6	July 16	August 17	3552
4	5	10	July 9	August 28	3724
			1954—Planted May 21		
1	0	0	--	--	2443
2	2	6	August 13	September 8	2959
3*	5	14	July 2	September 8	3437
4	7	14	July 2	September 8	3465

*Application of 2 inches on July 2 through error.

later and the application of water on August 17 was followed by a period of cool, cloudy weather with occasional light showers. Under these conditions one irrigation was definitely beneficial.

In 1954, it appeared that the results of 1952 would be repeated; however, 2.26 inches of rain fell ten days after the first irrigation of the severely wilted cotton thus providing a relative long period with nearly adequate moisture. Thus, one irrigation increased the yields. Based on these observations, it appears undesirable to allow cotton to reach a severely wilted condition before irrigating. However, even severely wilted cotton should respond favorably to irrigation if damp cloudy weather follows the first application of water or if a second application is made shortly after the first.

Treatment 3 approaches what appears to be an optimum moisture management practice for cotton. The yields were not different from those produced by Treatment 4 but fewer irrigations were required. Where the latter treatment was used, the first irrigation each year appeared to be wasted. There were also indications that the frequent irrigations as practiced with Treatment 4 favored vegetative conditions which might have proven harmful had rainy and cloudy weather occurred.

Taking all the data into consideration and considering observations in tests described here and in other tests, specifying accurately the optimum time to irrigate cotton is not possible at the present time. Plant characteristics and behavior seem to offer the best possibility for a practical definition of "when to irrigate cotton." Based on the present information this time can be roughly described on sandy loam and silt soils as "when the cotton begins to bloom near the terminals and not before the third week of blooming has been completed, the cotton begins wilting about noon, and the color changes to a dark green with a purplish cast."

The specifications for the time to irrigate cotton on sandy loam soils do not fit clay (buckshot) soils. The plants react to drought condition in a different manner on the two soils. On the clay soils, moisture deficiencies are manifest by reduced rate of growth rather than by marked changes in plant appearance. In one test, on a clay soil in 1954 approximately 4½ inches of water were applied on August 13 and again on September 12. Following each irrigation for a period of five to seven days the cotton suffered from lack of aeration. After recovering from the depressing effect there was a favorable plant response to the irrigation but the response was so late that no yield benefits were obtained. In another test on buckshot soil, one irrigation was applied to cotton on June 16 and no additional irrigations were made.

In this test the yields in pounds of seed cotton per acre were as follows: irrigated 1906, no irrigation 1820. Although the yields were only slightly different, there were definite indications that an early irrigation was beneficial; however, the June 16 date may have been too early for cotton planted May 23. In this test, the first favorable plant response was observed approximately one month after irrigating. Observations suggest that irrigation is needed somewhat earlier on buckshot than on sandy loam soils.

Rates Of Nitrogen and Irrigation. A study of the influence of irrigation on the response of cotton to different rates of nitrogen was conducted on a Dubbs fine sandy loam soil from 1952 to 1954. The irrigation water was applied by the furrow method using gated pipe. Approximately 2 inches of water were put on at each of the five irrigations. Anhydrous ammonia was used as the source of the nitrogen and was applied before planting at rates of 60, 90, and 120 pounds of nitrogen per acre in 1952 and 1953. During these two years it was apparent that the 60-pound rate was too low; therefore, a 150-pound rate was substituted in 1954. The three-year results of this test are shown in Table 11.

As indicated by the data, in 1952 and 1953 the yield of cotton increased as the

Table 11. The influence of irrigation on the yield response of cotton to different rates of nitrogen on a Dubbs fine sandy loam soil, 1952-1954.

Pounds of nitrogen per acre	Pounds of seed cotton per acre		
	No irrigation	Irrigated	Increase due to irrigation
	1952		
60	2317	2748	431
90	2465	3040	575
120	2727	3314	587
	1953		
60	2639	3426	787
90	2813	3529	716
120	3080	3708	628
	1954		
90	2224	3406	1182
120	2481	3477	996
150	2321	3476	1155

	1952	1953	1954
Date of planting	May 12	May 22	May 21
Times irrigated	5	5	5
Total water applied (inches)	10	10	10
Date of first irrigation	June 19	July 10	July 2
Date of last irrigation	August 18	September 1	August 16

rate of nitrogen increased and the effect of irrigation was fairly constant. There was no interaction between irrigation and rates of nitrogen. In 1954 the difference in yields between rates of nitrogen was small with no evidence that the 150-pound nitrogen rate was beneficial. It is of particular interest, however, to note that the high nitrogen rate with ample moisture had no significant adverse effect.

Although the results presented in Table 11 show no particular influence of irrigation on the response to nitrogen rates, the fact that approximately the same increase in yield was obtained at each level does point up the desirability of using a high rate of nitrogen under irrigated conditions. For economic reasons, a high level of production must be attained since the irrigation investment is the same regardless of the level of production.

The Relation Of Cotton Insect Control To Irrigation. Cotton insects thrive on healthy, succulent, rapidly developing cotton plants. Factors which promote such plant conditions can be expected to increase the insect problem. Since irrigation stimulates growth and development, it has an influence on insect control practices. An indication of the relationship between irrigation and insect control is illustrated by Table 12.

Table 12. The influence of rates of nitrogen and irrigation on the yield of cotton where insects were not controlled, 1953.

Pounds of nitrogen per acre	Pounds of seed cotton per acre	
	Irrigated twice	No irrigation
0	473	838
60	455	1224
90	490	1117
120	477	1056

The results in Table 12 show that cotton receiving no irrigation produced more than twice as much as the irrigated cotton. The reduced yields of the irrigated plots were attributed to insect damage. Under the conditions of this experiment where insect control measures were not practiced, the insect population was much higher on the irrigated plots than on the plots receiving no additional water. Contrary to normal expectations, the dry plots bloomed longer than the irrigated plots. This apparently resulted from fewer insects on the dry plots.

Under farm conditions in 1954, it was observed that irrigated cotton required four to six poison applications more than cotton receiving no irrigation. Although the number of insecticide treatments will vary with weather conditions, the need will be increased by irrigation.

The Relation Of Deep Tillage To Cotton Irrigation. The primary objective of deep tillage is to shatter hardpan conditions which restrict the movement of water in the soil. Deep tillage allows greater water intake and storage and permits more root development. It follows then that deep tillage should reduce the need for irrigation. Experiments conducted at the Delta Station in 1953 and 1954 have shown that moisture deficiencies were less severe where deep tillage was practiced on hardpan conditions. However, despite increases in yields ranging from 1,200 to 1,700 pounds of seed cotton per acre, there were indications that the moisture needs for cotton had not been satisfied by deep tillage alone. Severe wilting occurred during the month of August, and the yields obtained were lower than those produced on irrigated soils having no hardpan.

Considering the relation of deep tillage to irrigation from another viewpoint, a test was conducted in 1953 where water was applied to cotton growing on a soil with a severe hardpan. No deep tillage was practiced. The results are given in Table 13.

In the experiment reported in Table 13, the water was applied by sprinkling at the rate of two to three inches per irrigation. It was intended that the plots recieving five irrigations should have as much water as was needed. However, because of lack of penetration of the applied water, the cotton required irrigation every five days for favorable growth and fruiting. Because of the impracticability of applying water to cotton in 5-day intervals, the irrigation was stopped after the fifth watering. The results demonstrated the necessity for eradicating the hardpan condition before irrigation could be profitable.

Table 13. The influence of irrigation on the yield of cotton on a hardpan soil, 1953.

Times irrigated	Pounds of seed cotton per acre
0	823
1	807
2	967
5	1107

The Influence of Soil Type on Cotton Irrigation. Since soils vary in the amount of available water they will hold, irrigation practices can be expected to vary accordingly.

The results reported in Tables 10 and 11 were obtained from tests located on well drained sandy loam soils. In 1954, five irrigations providing 10 to 14 inches of water were required for maximum yields on these soils with the increase in yield due to irrigation averaging approximately 1050 pounds of seed cotton per acre.

In 1954 where cotton was planted on April 23 on a silty clay loam soil, the effect of irrigation was similar to the results on sandy loam soil. The yields in pounds of seed cotton per acre were as follows: no irrigation 2301, irrigated 3261 The water was applied on July 6, July 23, and August 17. Approximately 3 inches were added the first time and 4 inches in each of the other irrigations. It was indicated that the amount of water needed per irrigation on the silty clay loam soil was more than on the sandy loam soil but the intervals between irrigations were greater.

On clay soils, as was pointed out earlier, little or no benefit was obtained from irrigation under the conditions of the tests. The tests did indicate that more water per irrigation and fewer irrigations will be necessary than on other soils. Farm observations have indicated excellent response to irrigation on cotton and suggest that the Station tests were not representative with respect to increased yields.

In general, the tests and observations indicate that sandy loam soils will require less water per irrigation, but will require it more frequently than heavier soils; and that the finer the texture the more water will be needed per application, and the less frequent it will be needed.

Late Irrigation of Cotton. In determining the date to apply the last irrigation for cotton consideration must be given to insect control, boll rot, length of boll development period, temperature, and first date. Normally, 45 to 60 days are required for the development from bloom to open boll and the length of time will likely be greater during the late growing season. With an average frost date of November 4 at Stoneville, it appears doubtful that blooms occurring later than September 10 have much chance of developing into open bolls. Thus the primary reason for the last irrigation will be to provide moisture for the development of bolls already set rather than to set new ones. In one test in 1954 where cotton planted May 19 had been irrigated uniformly twice, a third application of water was made on September 8 on alternate 12-row plots replicated four times. The cotton showed moisture deficiencies at the time the last irrigation was made. The cotton yields in pounds of seed cotton per acre obtained were as follows: no late irrigation 2379, late irrigation 2633.

In this case the September 8 irrigation was definitely beneficial. The favorable results can be attributed to filling out the bolls already set since tagged bolls indicated that where the blooms occurred later than September 10, the bolls failed to open. In this test, the cotton had already begun to open when the last irrigation was applied and no yield differences occurred in the first picking with all of the increase showing up in the second picking. From a practical standpoint, the increased yield was partially offset by the increased insect control measures necessary. The maintenance of the plants in a healthy vegetative state can be expected to make additional poison applications necessary. The same conditions also will likely delay the opening date of cotton and will create conditions favorable to boll rot. Thus, determining the time to apply the last irrigation becomes one of compromise and early September is indicated.

Grass and Weed Problems In Irrigated Cotton. No studies have been made at the Delta Branch Experiment Station to determine the effect of irrigation on the weed and grass population and growth in irrigated cotton, nor has any special control work been done. Observation of irrigated fields show that irrigation does create a late grass and weed problem that is particularly harmful in the harvesting operation and especially so when mechanical harvesting is practiced. Cultivation after the first irrigation has proven helpful. A perfect stand of cotton probably provides the best means of minimizing the weed and grass problem. Under conditions where skips occur in the cotton, grass and weeds fill in while a good stand of cotton tends to shade them out.

Fiber Properties and Spinning Qualities of Irrigated Cotton. In an effort to determine the effect of irrigation on the quality of cotton, samples were drawn from each of the treatments in the tests previously described and fiber determinations made in cooperation with the U.S.D.A. Cotton Ginning Investigations Laboratory at Stoneville.

In the experiments where the moisture level was varied, (results reported in Table 10) the fiber properties were determined on samples from each field plot for the two years 1952 and 1954. The average results of like treatments are reported in Table 14.

These data show that as the water was increased, there was an accompanying increase in length of staple, a slight decrease in strength and no effect on fineness, uniformity or maturity.

The replicate samples were composited for the spinning tests. The spinning data are shown in Table 15. Although some variation occurs, there were no uniform differences and no trends indicated despite the differences shown in the fiber

Table 14. The influence of different moisture levels on the fiber properties of cotton, grown on a Dubbs fine sandy loam soil, 1952 and 1954.

Treatment[1]	Fiber length (UHM—inches) 1952	Fiber length 1954	Fiber length Ave.	Strength Pressley 1000 lb. sq. inches 1952	Strength 1954	Strength Ave.	Fineness micrograms per in. 1952	Fineness 1954	Fineness Ave.	Uniformity ratio—index 1952	Uniformity 1954	Uniformity Ave.	Maturity index 1952	Maturity 1954	Maturity Ave.
1	1.08	1.04	1.06	84	88	86.0	3.9	3.6	3.75	76	75	75.5	78	75	76.5
2	1.09	1.06	1.075	84	86	85.0	3.8	3.7	3.75	78	75	77.5	78	76	77.0
3	1.10	1.07	1.085	82	85	83.5	3.7	3.9	3.80	76	75	75.5	77	76	76.5
4	1.11	1.13	1.12	81	84	82.5	3.4	3.7	3.55	74	77	75.5	74	76	75.0

[1] See Table 10 for information on number of irrigations and total quantity of water applied.

Table 15. The influence of different moisture levels on the spinning qualities of cotton grown on a Dubbs fine sandy loam soil, 1952 and 1954.

Treatment[1]	Neps in card web No. per 1000 sq. in. 1952	Neps 1954	Yarn strength (lbs.) carded 22's 1952	Yarn strength carded 22's 1954	Yarn strength (lbs.) carded 50's 1952	Yarn strength carded 50's 1954	Yarn appearance carded 22's 1952	Yarn appearance carded 22's 1954	Yarn appearance carded 50's 1952	Yarn appearance carded 50's 1954	Average yarn appearance index 1952	Average yarn appearance index 1954
1	8	9	118.8	123.7	41.2	42.6	B	C+	C+	C	105	95
2	10	10	120.6	122.2	41.3	42.9	B	B+	C+	C+	105	110
3	10	12	117.9	124.7	40.7	43.2	B	B	C+	B	105	110
4	13	8	120.1	124.0	41.3	43.7	B	C+	C	C+	100	100

[1] See Table 10 for information pertaining to number of irrigations and and total quantity of water applied.

tests. There was no indication that irrigation increased the nep count or had any other adverse effect.

Where rates of nitrogen and irrigation were varied (the yields are reported in Table 11) the fiber determinations were made on samples from each plot. Like treatments are averaged and reported in Table 16. Again the staple length was slightly longer and slightly weaker on the irrigated plots. Irrigation had no effect on fineness, uniformity or the maturity index. None of the fiber properties were affected significantly by varying the rate of nitrogen.

The replicate samples were composited and spinning tests run on the 1952 cotton only. There were some variations in the spinning data but no significant differences due to irrigation or varying rates of nitrogen.

The influence of irrigation on the fiber properties of cotton grown on different soil types is shown in Table 17. The data shown are averages of the respective irrigation treatments. The samples from the Sharkey clay soil do not fit the usual pattern of longer staple and lower strength but there was no yield response to the irrigation in this test.

An evaluation of all of the fiber and spinning data shows that where irrigation was applied, the fiber was approximately .04 inches or slightly over 1/32 inch longer, the fiber strength was 3000 pounds per square inch less based on Pressley determinations, other fiber properties were not affected and irrigation had no significant influence on the spinning qualities.

Irrigation tended to correct abnormalities created by the drought, but apparently had no other effect. This can be substantiated by examining data from selected plots which received no irrigation but where the drought had a differential effect as indicated by plant appearance and yield. The drought differences were due to difference in the soil. These data are shown in Table 18.

Table 16. The influence of irrigation and rates of nitrogen on the fiber properties of cotton grown on a Dubbs fine sandy loam soil, 1952 and 1954.

Year	Pounds of N per acre	Irrigation[1] treatment	Fiber length UHM (in.)	Strength—Pressley 1000 lb. per sq. in.	Fineness micrograms per inch	Uniformity ratio	Maturity index
1952							
	60	No irrigation	1.07	84	4.0	76	78
	90	No irrigation	1.06	85	4.0	77	78
	120	No irrigation	1.08	85	4.0	75	77
	60	Irrigated	1.10	80	3.8	73	75
	90	Irrigated	1.13	83	3.7	74	75
	120	Irrigated	1.11	82	3.8	73	76
1954							
	90	No irrigation	1.07	87	3.8	74	75
	120	No irrigation	1.08	86	3.9	74	75
	150	No irrigation	1.07	86	3.6	74	74
	90	Irrigated	1.11	84	4.0	72	75
	120	Irrigated	1.09	84	4.1	75	77
	150	Irrigated	1.12	83	4.1	74	77

[1] See Table 11 for information on number of irrigations and quantity of water applied.

Table 17. The influence of irrigation on the fiber properties of cotton grown on different soil types, 1954.

Soil type	Irrigation treatment	Number of irrigations	Total inches of water applied	Fiber length UHM inches	Strength—Pressley 1000 lbs. per sq. in.	Fineness micrograms per inch	Uniformity ratio	Maturity index
Sandy loam								
	No irrigation	0	0	1.10	84	3.8	76	77
	Irrigated	5	10	1.14	83	3.8	76	78
Silty clay loam								
	No irrigation	0	0	1.08	88	3.6	76	76
	Irrigated	3	11	1.12	85	3.8	75	77
Sharkey clay								
	No irrigation	0	0	1.12	87	3.6	78	78
	Irrigated	2	8	1.14	89	3.6	77	78

Table 18. The influence of drought on fiber length and fiber strength of cotton, 1954.

Degree of drought damage	Fiber length UHM (inches)	Strength Pressley 1000 lbs. per sq. in.
Severe	.90	84
Moderate	1.01	85
No apparent damage	1.14	83

Although no irrigation was applied on any of the plots, the fiber was as long where no drought injury occurred as on any of the nearby irrigated plots. The fiber length varied more in those plots receiving no irrigation than it did in the tests where irrigation and no irrigation were compared.

Corn

Moisture has long been thought to be a limiting factor in corn production in the Mississippi Delta and frequently good corn prospects fail to materialize due to lack of water during the silk and tassel stage.

The corn irrigation tests at the Delta Station have been designed to study the influence of irrigation on yields, to investigate the effect of irrigation on fertilizer practices, and to study irrigation frequency. Dixie 22 corn was used in all of the tests.

When to Irrigate. The influence of frequency of irrigation on the yield of corn has been studied on a well drained, sandy loam soil. The test was fertilized uniformly each year with anhydrous ammonia at the rate of 120 pounds of nitrogen per acre before planting. In 1952, the water was applied by sprinkling with perforated pipe and in 1953 and 1954 irrigation was done by the furrow method with gated pipe. The experiment was designed to study the following moisture variables: (1) No irrigation, (2) irrigation when the soil moisture had reached the permanent wilting percentage, (3) irrigation when soil moisture had dropped to 50% of available capacity and (4) irrigation when the soil moisture had dropped to 75% of available capacity. The determinations of the varying moisture levels were attempted during 1952 and 1953 with Bouyoucos blocks and tensiometers. The tremendous variations of moisture readings within plots and between plots of similar treatment caused the reliability of the measurements to be questioned. In 1954, the time to irrigate was determined by plant appearance. The entire test was irrigated by sprinkling in 1953 for germination. The 3-year results of this test are shown in Table 19.

In each of the three years, the more frequent irrigations produced the highest

Table 19. The influence of irrigation at different moisture levels on the yield of corn on a Dubbs fine sandy loam soil, 1952-54.

Moisture level when irrigated	No. times irrigated	Total inches of water applied	Date of first irrigation	Date of last irrigation	Bushels of corn per acre
			1952—Planted May 13		
1	0	0			68.6
2	2	2	July 9	July 29	85.0
3	5	10	June 25	August 14	91.0
4	7	14	June 18	August 14	97.7
			1953—Planted June 2		
1	0	0			69.9
2	1	2	August 17	August 17	70.5
3	3	6	July 16	August 17	86.7
4	5	10	July 9	August 28	93.0
			1954—Planted April 19		
1	0	0			73.0
2	1	3	July 12	July 12	77.1
3	3	8	June 16	July 12	94.9
4	4	8	June 16	July 12	98.9

Table 20. The influence of irrigation on the response of corn to different rates of nitrogen on a Dubbs fine sandy loam soil, 1952-54.

Pounds of nitrogen per acre	Bushels of corn per acre		Increase due to irrigation
	No irrigation	Irrigated	
	1952		
120	62.5	93.6	31.1
180	61.8	92.2	30.4
240	64.6	92.4	27.8
	1953		
120	77.4	92.9	15.5
180	74.6	90.3	15.7
240	71.5	90.7	19.2
	1954		
120	64.4	96.2	31.8
180	61.6	91.8	30.2
240	63.3	93.1	29.8

	1952	1953	1954
Date of planting	May 13	June 2	April 19
Times irrigated	5	4	3
Total water applied (inches)	10	8	6
Date of first irrigation	June 19	July 9	June 16
Date of last irrigation	July 29	August 18	July 16

yields. However, Treatment 3 gave the greatest return for water applied. Remaining unanswered is the question whether heavier rates of watering at less frequent intervals may have been just as satisfactory as the best treatment used.

Rates of Nitrogen and Irrigation. A study of the influence of irrigation on the response of corn to different rates of nitrogen was conducted from 1952 to 1954. The rates of nitrogen chosen for comparison were 120, 180 and 240 pounds of nitrogen per acre. The 120-pound rate had been found to be optimum under dry conditions and for that reason, the higher rates seemed to offer more promise in the test. Anhydrous ammonia was used as the source of nitrogen each year and was applied before planting. The water was applied by the furrow method using gated pipe. Dixie 22 corn was used and was spaced 12 inches apart. Results of this test are shown in Table 20. The 3-year results show no difference in yield as a result of varying the rates of nitrogen.

An increase in yield was obtained each year from irrigation but the response to nitrogen was not affected.

In a test located on Sharkey clay (buckshot) soil, nitrogen was applied at rates varying from 60 to 180 pounds per acre in 30-pound increments. Due to a winter legume history on the land, the nitrogen level was rather high at the beginning of the test. The stand of corn was poor in both 1952 and 1953 with the spacing averaging one plant every 24 inches. The irrigation was done with gated pipe.

Table 21 shows the influence of rate of nitrogen and irrigation on the yield of corn on a buckshot soil. In this test the corn was planted on May 16 in 1952 and May 28 in 1953. The water was applied on July 3 and July 25 in 1952 and on July 8 and August 5 in 1954 at the rate of approximately four inches per irrigation.

In 1952 increasing the rate of nitrogen failed to increase corn yields where no irrigation was used. With irrigation, 60 pounds of nitrogen per acre was beneficial but no yield increases were obtained from higher nitrogen rates. In 1953, where no irrigation was used, the 60-pound rates of nitrogen increased the corn yield over the check but higher rates had no effect. Under irrigation there were slight increases in yield as the rate of nitrogen increased. During the two years, the average increase in yield by irrigation of the fertilized plots was 30.5 bushels per acre.

The effect of irrigation on the lodging of corn has been questioned and, although detailed information was not collected, observations indicate that the severity of the lodging depends on the time lapse between the date of irrigation and the date windy conditions occur. When high winds occur immediately following an application of water, the lodging has been more severe than where no water was applied. On the other hand, if two to three days elapse before high winds occur, the irrigated corn stands much better than the dry corn. This is due, at least in part. to the increased root development following irrigation.

Soybeans

A test was initiated in 1952 on a Dubbs fine sandy loam soil to study the influence of irrigation at various moisture levels on the yield of soybeans. The treatments planned were the same as those described previously for cotton. It developed that the plants were affected less by drought than cotton or corn. The time to irrigate was determined by Bouyoucos blocks in 1952 and by the soil-feel method in 1954. The 1953 test was abandoned because of poor stands. The Ogden variety was used in 1952 and the Lee variety in 1954. The water was applied by sprinkling in 1952 and by the furrow method in 1954. The 2-year results are shown in Table 22.

Since the yield of the unirrigated beans was so high, the results of these tests may not have application under most farm conditions. It is of particular interest to note, that although the soybean test was located between the similar tests for cotton and corn, the soybean response was considerably less than was true with the other crops. It was indicated that the peak need for water was during fruit set. The wettest treatment produced largest plants, the beans were set slightly higher on the plants, and more lodging occurred.

The results of another test conducted on buckshot soil in 1952 are as follows:

Table 21. The influence of irrigation on the response of corn to varying rates of nitrogen on a Sharkey clay soil, 1952 and 1953.

Pounds of nitrogen per acre	1952 Bushels of corn per acre No irrigation	1952 Irrigated	1953 No irrigation	1953 Irrigated
0	8.3	31.4	12.4	19.8
60	9.7	48.6	21.8	38.7
90	11.7	49.5	19.8	39.4
120	11.4	48.0	17.3	42.5
150	10.7	47.0	21.4	44.4
180	10.5	49.6	20.1	52.5

Table 22. The influence of irrigation at different moisture levels on the yield of soybeans on a Dubbs fine sandy loam soil, 1952 and 1954.

②

Moisture level when irrigated	No. of irrigations	Inches of water applied	Date of 1st irrigation	Date of last irrigation	Bushels per acre
		1952—Planted May 14			
1. No irrigation	0	0	———	———	24.5
2. Permanent wilting percentage	1	2	Aug. 25	Aug. 25	29.3
3. 50% of available capacity	5	10	June 25	Aug. 25	31.7
4. 75% of available capacity	7	14	June 18	Aug. 25	30.9
		1954—Planted May 25			
1. No irrigation	0	0	———	———	37.4
2. Permanent wilting percentage	1	3	Sept. 8	Sept. 8	44.3
3. 50% of available capacity	4	12	July 16	Sept. 8	44.5
4. 75% of available capacity	7	14	July 2	Sept. 8	40.6

No irrigation 29.1 bushels per acre, irrigated 38.7. In this test the water was applied by sprinkling with perforated pipe on August 19 and September 13. Accompanying the increased yield was an increase in the size of the seed.

One soybean irrigation test was conducted in 1953. It was located on a sandy loam soil and the Jackson variety was used. Approximately two inches of water were applied by sprinkling on August 4, August 17, and September 3, a total of 6 inches. The bean yields were as follows: No irrigation 12.9 bushels per acre, irrigated 23.2.

Summarizing the results of the soybean experiments: (1) Yields have been increased 6 to 10 bushels per acre, (2) irrigation before the fruiting stage began, apparently was not beneficial, (3) soybeans remained in an unwilted condition much longer than cotton or corn under drought conditions, and (4) the size of the soybean seed were increased by irrigation.

Pastures

In considering pasture irrigation in the Mississippi Delta, it is well to keep in mind the place of livestock in the average Delta farm operation. In most cases, land allocated to perennial pasture production is heavy clay or at best heavy mixed land. Lighter soils planted to pastures will likely be used in rotation with row crops. Here the pastures will usually be left in production from 2 to 4 years.

Most of the Delta pastures will be utilized for beef cattle. Because of the extensive nature of the beef production enterprise a relatively low gross return per acre may be expected. Where irrigation is to be used on pastures, it must be in conjunction with other good farming practices. The livestock program must be intensified as much as practical in order that maximum pasture utilization and high beef yields may be obtained.

Perennial summer grasses that offer opportunities for successful irrigation are: Johnson, Çoastal and Common Bermuda, and Dallis. Alfalfa is the only perennial legume that seems to have potentialities for irrigation. However, white clover, in association with Common Bermuda, may prove satisfactory where a good mixture is available. Where high levels of nitrogen are used on grass-clover mixtures, the clover will be quickly crowded out by the heavy growth of the grass. In most cases the grass will dominate the pasture during the irrigation season (June 15 to the end of October).

Due to the high water requirement of pastures as compared to row crops, it is more important to design pasture irrigation systems so that water may be applied as cheaply as possible.

In most cases sprinkler irrigation systems will be too costly to use for pasture irrigation. In the Mississippi Delta, a large percentage of the heavy clay pasture land is reasonably level and thus offers possibilities for some type of flood irrigation. The contour check system of flooding as used in rice production with some modification will prove satisfactory on many pastures. This system will particularly be suited to perennial pastures where ditches, levels, etc., may be used for several years, thus reducing the overhead expenses of the system.

When the land, type of pasture, and system of irrigation have been established, the next point to be considered is that of pasture management. It is essential to have a well established sod of an adapted summer grass in good condition if irrigation is to pay. Over-grazing must be avoided. The most common error made in irrigating pastures is that of waiting too long before applying water. Pastures require irrigation a considerable time before row crops. During a year of average rainfall, about 12 inches of water may be required. The first irrigation on Delta pastures will usually be required about the last week in June or, to put it another way, about two to three weeks after the last heavy rain.

Delta pastures require about 6 inches of water per month during the hot weather in late June, July, August, and September. When rainfall is about 3 inches short it will be time to start pasture irrigation.

Fertilization Under Irrigation. In order to get efficient use of irrigation water, a high level of soil fertility must be maintained. The minimum requirement of a grass pasture in warm weather is about one pound of nitrogen per acre per day. In order to have uniform pasture production throughout the summer, the nitrogen fertilizer should be applied just prior to irrigation at from 30 to 45 pounds of nitrogen per acre per application. Heavier less frequent applications will result in an excessively high level of protein in the forage for a short time and a subsequent deficiency. When the level of protein is too high (over 18 percent), the excess protein will not be used by the grazing animals to best advantage.

In addition, the dry matter consumed by the animals may be reduced as the palatability of herbage is actually reduced when the protein content is too high.

Another very important reason for frequent small applications of nitrogen is to level out the curve of pasture production so there will be a uniform amount of forage available throughout the summer. This is important in order that the pastures may be fully utilized with about the same number of cattle throughout the grazing season.

Management of Irrigated Pastures. The grazing of irrigated pastures presents special problems and opportunities not found in dry pastures. When the pasture has been grazed to from three to six inches in height and is in need of irrigation, cattle should be removed.

The pasture should be clipped if the grazing was not uniform or if there are weeds present. The fertilizer should be applied and in some cases the manure spread. After irrigation is completed, cattle should not be returned until the ground has become firm in order to prevent bogging and damage to the sod by the grazing animals. It will pay to keep the animals off the pasture until the grass has made a growth of from 8 to 18 inches in height, depending on the species of grass in the pasture. The best plan for managing irrigated pastures is to divide into at least two areas, and preferably four, and rotate the cattle from area to area. Thus with two pastures, each would be grazed one-half of the time. With four pastures, each would only be grazed one-fourth of the time.

Many experiments conducted in humid and irrigated areas, indicate that the four-field system of rotational grazing will increase yields by about 25 percent over continuous grazing.

Table 23 gives beef yields of newly established irrigated pastures on heavy clay soil at the Delta Branch Experiment Station in 1954, the grazing being done the year of planting.

These yields were obtained with two heavy irrigations totaling about 9 inches of water, one in mid-July and one in mid-August. One more irrigation was needed in late September, but the water was not available. This lack of water considerably reduced the October grazing. During the entire period of this test, dry land pastures were almost completely unproductive due to the extreme drought of the spring and summer of 1954. Based on the above study, on a properly fertilized irrigated pasture, rotationally grazed with young cattle, a beef production of 100 pounds

Table 23. Beef yields of Johnson, Dallis, and Coastal Bermuda grass pastures on Sharkey clay, irrigated twice with total of 9 inches of water, 1954.

	Type of pasture		
	Johnson	Dallis	Coastal Bermuda
Date grazing started	July 26	July 26	July 26
Total days grazed	63	70	101
Daily gain per animal	2.11	1.83	2.02
Total gain per acre	347	305	381

per acre per month should be expected.

Annual Grazing Crops. Sudan grass and millet respond well to irrigation. These crops may be handled practically the same as perennial crops except that growth should be about 2 feet in height prior to turning in the grazing animals. Also, the crops should be planted in rows and cultivated once to twice to reduce weed growth.

Winter Grazing Crops. Winter growing, grazing crops such as fescue, oats, wheat, ryegrass, etc., may be irrigated once in the fall, early in September, to germinate the seed and stimulate early fall growth. In the case of fescue, one heavy irrigation will normally be sufficient to supply the crop until fall rain. In the cases of annual crops, the fields may be flooded or sprinkled before or after seeding. On clay land, flooding after seeding will prove more satisfactory because of the difficulty of preparing and planting a seed bed on this type of soil.

Alfalfa

Alfalfa has been irrigated two seasons at the Delta Station. In 1953, a field of alfalfa growing on Bosket very fine sandy loam soil was irrigated twice by contour flooding. This soil had a hardpan condition which prevented good penetration of the irrigation water. The first irrigation increased the alfalfa yield by about 3/4 ton of hay. Subsequent irrigations promoted the growth of grass at the expense of the alfalfa and many plants died. The resulting hay crop was almost entirely crabgrass which replaced the dead alfalfa. In 1954, a second field of alfalfa on Sharkey clay was irrigated. The water was applied by perforated pipe immediately after cutting with a single irrigation per cutting. In this test, two irrigations increased the yields over the check by somewhat over 3/4 of a ton of hay per irrigation. In another case where only one irrigation was applied, regrowth following the next cutting was definitely faster, indicating that all the water (4 to 5 inches) of a single irrigation was not used on the growth of one cutting of hay. The stand of alfalfa on the clay land was not injured by irrigation. Alfalfa seems to offer possibilities for economical irrigation on heavy soils.

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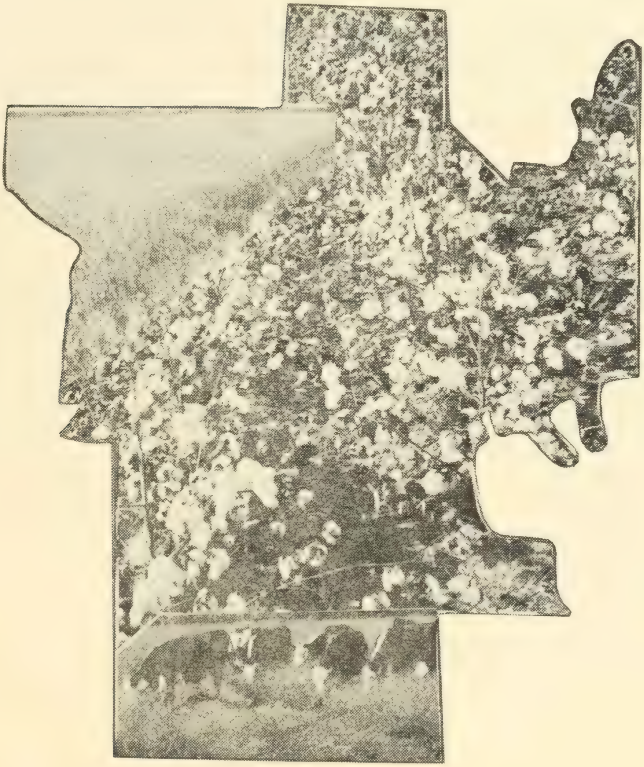
Humphreys County Soils



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FOREWORD

Humphreys County is primarily an agricultural area and as such most of its wealth comes from the soil. Actual crop yields account for a large share of the money brought in the area each year. Further refining of these products of the land adds to the income of the county. Thus the welfare of the people of Humphreys County is closely tied to the soil. Into it many of them direct their energy and resources. From it they not only earn a livelihood but export essential farm products to other areas. A sound knowledge of the soil is important to the man who obtains his living directly from this source.

Soil maps are now available for the farmers of Humphreys County upon request. This bulletin has been prepared to accompany these soil maps as a summary of the county's soil survey program. The suggestions for management and land use found in this report are based on field experiments, observation and field studies, and the experience of good farmers.

It is hoped that this soil report may help you in the following ways: (1) to have a clearer knowledge of the general traits of each soil on your farm; (2) to know the capabilities and limitations of each soil; thus in return, helping you to use each acre for its best adapted use; and (3) to help make you conscious of the value of your soil and the importance of conserving it.

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Area Inspected By: I. L. Martin, Senior Soil Correlator, Division of Soil Survey, United States Department of Agriculture

The soil survey of Humphreys County, Mississippi, is a cooperative contribution from the—

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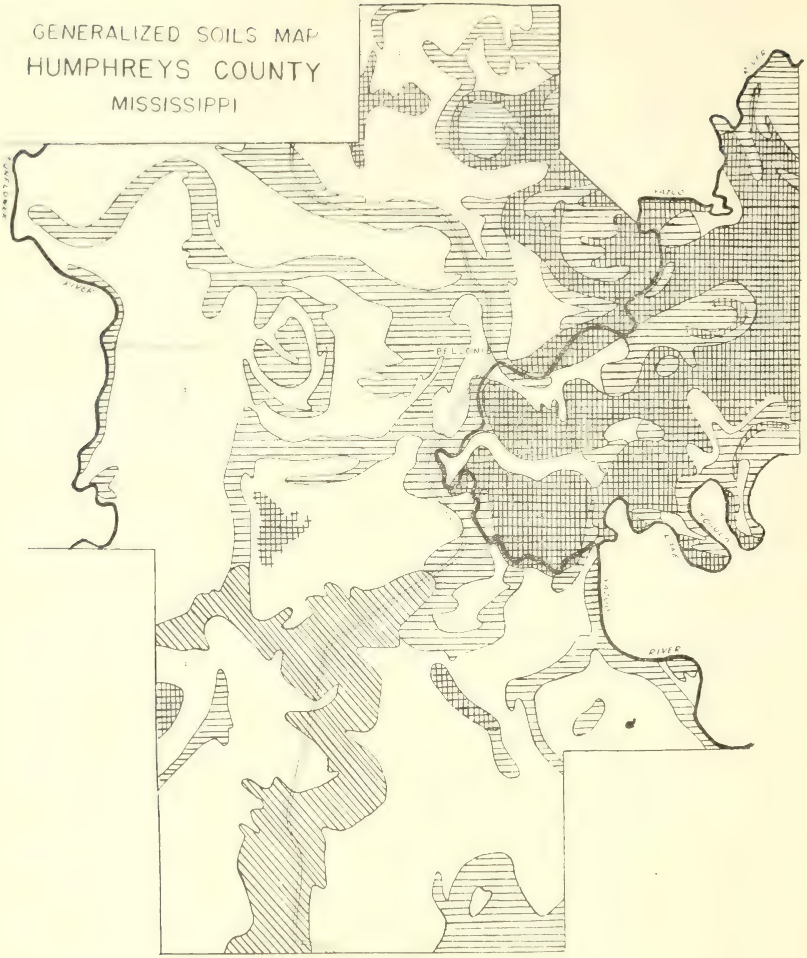

GENERALIZED SOILS MAP
HUMPHREYS COUNTY
MISSISSIPPI
SUNFLOWER
RIVER
RIVER
YAZOO
BELZONI
TCHULA
LAKE
YAZOO
RIVER

Major Soil Groups in Humphreys County

☰	Loamy Soils (Forestdale, Dundee, and Dubbs silt loams and loams with some Dowling soils)
▧	Loamy and Silty Soils in Mixed Pattern (Forestdale, Dundee, Brittain, Pearson, and Dubbs silt loams and loams with some Dowling Soils
□	Clays, Silty Clays, and Silty Clay Loams (Alligator, Forestdale, and Dowling Soils)
▦	Overflow Phases of Clays, Silty Clays, Silty Clay Loams, and Silt Loams (Alligator, Dowling, and Forestdale soils)

HUMPHREYS COUNTY SOILS

By CLATIE POWELL

An inventory of your soils and their general features has been made. The results are recorded on your soil map. On the following pages is information which will help you get better acquainted with these soils. By carefully studying the data and suggestions given, you can approximate your soil wealth and determine how best you can make this wealth serve you. In three (3) easy steps, here is how!

1. GET A MAP OF YOUR FARM

These free maps may be ordered through the Humphreys County Soil Conservation Service or the County Agent. The common symbols on page 10 are used show roads, railroads, churches, and schoolhouses, farm houses, streams, ditches, and other general features of the area.

2. STUDY THE FACTORS THAT HAVE INFLUENCED YOUR SOILS MOST.

Such factors as parent material, relief and drainage, vegetation, climate, age, and past agriculture are discussed beginning on page 5.

3. KNOW YOUR SOILS AND PLAN THEIR USE.

Every separate area of soil is indicated on the map by a symbol composed of numbers and letters. Each number and letter shows a specific characteristic or condition of the soil. Learn what the numbers and letters in your soil symbols mean by studying the discussion on page 8 and the diagram on page 11.

Beginning on page 12 some good uses of soil maps are discussed. To determine management groups in which your soils are located and the page number on which they are discussed, use the index. For further information, turn to the table of contents.

Factors That Have Influenced Your Soil Most

Have you ever asked yourself why your soils are as they are? The following six (6) factors are mostly responsible:

1. Parent Material—all soils of this county were formed from sediments laid down during overflows of the Mississippi River or its tributaries. These sediments (called alluvium) are mostly sand, silt, and clay in varying amounts. They were gathered from some thirty (30) states lying north of Humphreys County and between the Rocky and Appalachian Mountains. In other words, the soil locally called mixed land may be made up of sand from the hills of Kentucky, silt from the glacial section of Montana, and clay from the prairie sections of Iowa. These sands, silts, and clays were dropped in this area during overflows, becoming the **parent material** for Humphreys County soils.

The overflows occurred as follows: Before the stream overflowed, it carried sand, silt, and clay in rapid currents. As the swollen stream flowed over its banks and spread over its flood plain, the different speeds of the overflow water separated and assorted the sands, silts, and clay into the pattern in which they were laid down. Sand, being the heaviest kind of soil particles carried by the stream, was the first to drop out of the fast moving water, and, therefore, was placed closest to the stream. This resulted in the formation of sandy natural levees. Silt, being the second heaviest soil fraction, was laid down as the speed of the overflow water slowed. This resulted in a part of the natural levee formations, usually the lower altitudes, having silty soils. Clay, the smallest soil fraction by size and weight, stayed in suspension longer than the sand and silt and was dropped by the overflow water as it covered the slackwater areas for long periods of time.

This resulted in large areas of clayey soils.

Many combinations of the above types of depositions occur as a result of the varying speeds of the flood water. In places sandy natural levees have been formed by fast moving flood water and later have been covered by clay sediments from very slowly moving or still water. The reverse of this is also true.

2. Relief and Drainage—The relief of an area governs surface runoff and erosion. Terms used to show relief in this county are: Level, nearly level, gently sloping, and sloping. The nearly level relief (1/2 to 2 percent slope) is by far the most common. Some of the stronger slopes have fast surface runoff and were formed under much less moisture than soils of the low areas which collect runoff water from adjoining higher land. These low areas were formed under excessive moisture and reflect this past drainage by having highly mottled, gray subsurface layers. Dowling, Alligator, and Forestdale soils (soils that occur in low swags, slackwater areas, and on lowest altitudes of old natural levees, respectively) are good examples of the grey colored soils. The brownish colored subsurface layers of Dundee, Dubbs, and Bosket soils (soils that occur on the higher altitudes of old natural levees) reflect good past drainage.

The altitude of this county ranges from 90 to 120 feet above the mean gulf level, decreasing from north to south. The highest points of the county are on the old natural levees where the soils range from 120 feet along Paxton Brake in the north to 100 feet along Silver Creek on the southern boundary. Slackwater (clay) soils occur on altitudes of 105 feet in the north and less than 100 feet in all other parts. Belzoni, the county seat, is 110 feet.

Some parts of Humphreys County have good natural drainage while other parts remain covered with overflow water for several months during most years. The Yazoo River winds through the eastern half of Humphreys County. While near its flood stage, a portion of the water carried by this river backs up the small lakes and bayous that join it. This causes them to overflow. Some years the Yazoo River overflows. As a result of these overflows, there are some fairly large areas in the eastern half of Humphreys County that are covered with water for such long periods they are used only for woodland.

The Sunflower River, forming a portion of the county's western boundary, is another important permanent stream of the county. A few of its small bayou tributaries overflow most years. Many improvised drainageways, ranging in size from large canals to shallowly dug ditches, have been constructed to empty into the natural streams. Through this extensive improvised drainage system, today, the surface drainage of the county is much improved over the drainage conditions in the early days of this county.

3. Climate—The annual rainfall of Humphreys County is slightly more than 46 inches. The average temperature is 64.9°F., but ranges from 0 to 108 degrees. Temperature where the moisture supply is sufficient, regulates the organic matter content of the soil. Where high temperatures occur, soils usually have low amounts of organic matter. Soils in areas of low temperatures tend to accumulate organic matter. With the high spring, summer, and fall temperatures of this area, most soils are fairly low in organic matter.

The nitrogen and organic matter content of soils are closely related. A low organic content indicates a low nitrogen level; a high organic content indicates a high nitrogen level. Humphreys County soils usually respond well to applications of nitrogen for non-legume crops.

High rainfall causes a great loss of plant nutrients from the soil by leaching and erosion. All soils in areas of high rainfall, due to leaching, are acid or becoming acid. Most of Humphreys County soils range from slightly to very strongly acid.

See Table 1 for summary of past weath-

Table 1. Normal monthly and annual temperature and precipitation at Belzoni, Humphreys County, Mississippi.
Altitude 110 feet.

Month	TEMPERATURE			PRECIPITATION				
	Average	Highest recorded	Lowest recorded	Average	Total amount for driest year, 1943	Total amount for wettest year, 1946	Maximum rainfall ever recorded for each month	
	°F	°F	°F	Inches	Inches	Inches	Inches	Year recorded
January	47.2	82	0	5.29	1.66	10.93	13.01	1949
February	50.1	84	5	4.19	1.33	8.55	11.05	1948
March	57.3	88	14	5.13	6.09	8.12	9.68	1945
April	65.3	93	31	4.19	2.08	2.94	10.99	1947
May	73.1	101	38	4.34	3.45	6.84	15.60	1930
June	80.1	108	50	3.12	2.22	9.76	9.76	1946
July	82.5	108	55	3.43	.78	5.30	7.42	1945
August	82.1	106	52	2.11	.67	.43	5.49	1950
September	76.6	102	39	1.99	3.47	1.11	6.56	1950
October	61.6	97	28	2.31	1.45	2.19	8.44	1941
November	54.8	88	16	4.43	4.16	7.45	17.94	1948
December	48.3	84	12	5.86	3.18	4.76	14.75	1931
Annual	64.9	108	0	46.39	30.54	68.38		

Based on 25-year (1930-1954) U. S. Weather Bureau Reports.

Killing Frost	Average last in spring	Mar.21
	Average first in fall	Oct. 31
	Earliest killing frost	Oct. 17
	Latest killing frost	Apr. 13
	Crops severely injured by frost on	May 4, 1954
Growing Season	Average	224 days

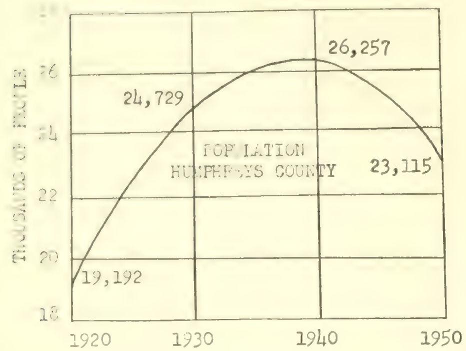
er conditions for your county.

4. Vegetation—When the first settlements were made, Humphreys County was entirely covered by forests. The forests consisted mostly of hardwood trees with cypress as the only native conifer. Cane breaks and a dense undergrowth of vines were found where light was sufficient. About 60 percent of the county has been cleared of its native vegetation. Most of the remaining 40 percent of woodland has been cut over and abused. Due to unmanaged cutting, fire, and other destructive influences, much of the present woodland is in low-grade or cull trees.

The remaining woodlands usually occupy the clayey soils scattered throughout the county or the overflow areas near the Yazoo River and its tributaries. Various species of oak, gum, hickory, pecan, hackberry, elm, ash, willow, cypress, and similar trees are found growing.

5. Age—Parent material that has been in place the longest has been influenced most by relief and drainage, climate, and vegetation. The old natural levee formations have been free from overflow water longer than the other soils. Therefore, they have been influenced more. Usually they contain less organic matter and have had more leaching and erosion. They were also the first cleared and have had more plant food removed through cultivated crops. These are the soils that will probably first need complete fertilizers. The low swags get annual sediments washed in from surrounding higher soils or from backwater flooding. These are the youngest soils of the county and are usually higher in plant food. However, excess water and poor internal drainage limit them from being the most productive.

6. Past Agriculture—Since the time of settlement, the agriculture of this county



In this agricultural county, a decline in population would naturally follow the adoption of modern mechanized farming methods. Many fields used for cotton production in 1930 and 1940 are now planted to pastures, rice, soybeans, and other crops that require much less labor than cotton.

has centered around cotton. Cotton has always occupied the largest acreage of cropland with corn, oats, soybeans, rice, hay crops, and pastures occupying smaller acreages.

The first white settlers reported that the rich Delta soils produced high yields by just clearing land and placing seed in the soil with a minimum of cultivation and no fertilizer. This word spread through several southern states and brought many farmers to the Delta counties. They cleared small patches and planted cotton. Huge yields were usually harvested each fall, stimulating the desire to clear much larger areas for the following years. This resulted in the establishment of large plantations.

Rotations for maintaining good tilth and high fertility levels were not practiced. Row direction was used only to get maximum drainage and seldom ever for prevention of erosion. The general thinking was that if and when the cleared land became depleted of its natural fertility and good tilth, there was always plenty of good land to be cleared. This type of past management has resulted in some locally-called thin, or poor land.

Since the coming of cotton allotments, the trend has been towards putting the best all-around land in cotton and putting the remaining land to some more adapted use such as pastures, rice, soybeans, or hay. Soil improving and soil conserving practices are being given some more attention.

See Table 2 for acreages and yields of some commonly grown crops in Humphreys County.

Using Your Soil Map

First Examine Your Soil Map

Note Symbols—The first step in using your soil map is to examine it carefully and become familiar with the symbols used to designate certain features found on the land. These symbols are listed on page 10.

Every separate area of soil is indicated on the map with a symbol. The first three numbers of the symbol tell the soil type but each number shows a special feature of the soil type. The first number refers to the position and kind of soil sediments from which it was formed. The second number indicates how well excess water will pass through the soil. The third number gives the surface of texture (per cent of sand, silt, and clay in the surface layer). These three numbers are followed by a capital letter giving the slope of the land, a number giving the degree of erosion, and another capital letter giving the present land use. This combination of numbers and letters are called the mapping unit.

When the soil symbol is underscored once on the map, it indicates that the soil profile rests abruptly upon a clay layer at a depth of 14 to 20 inches. When the soil symbol is underscored twice, it indicates that the soil profile rests abruptly upon a clay layer at a depth of 20 to 30 inches. Should a lower case "f" occur at the end of the symbol, it shows that the

GENERAL INFORMATION ON HUMPHREYS COUNTY FARMS*

	1924	1929	1934	1939	1944	1949
Total area in county—acres						262,400
Total area in farms—acres	101,836	132,828	172,717	191,071	191,071	212,842
Total cropland harvested—acres	71,274	106,260	107,145	124,021	126,076	117,828
Corn (harvested for grain)						
acres:	11,322	12,017	36,217	43,077	22,494	13,417
bushels:	134,882	267,113	598,385	636,690	233,571	234,720
Average bu./acre:	12	22.2	16.5	14.8	10.3	17
Cotton (harvested)—acres:	58,802	92,707	57,500	60,792	62,806	97,838
bales:	25,573	51,140	29,589	49,436	54,464	51,100
Average bales/acre:	.43	.55	.51	.81	.86	.52
Hay crops (total) with sorghum being excluded)—acres:	735	401	7,823	11,276	11,003	5,202
Oats (threshed or combined)						
acres:	116	24	301	3,906	19,471	2,028
bushels:	3,200	1,000	6,310	160,939	686,601	41,927
Average bushel/acre:	27.6	41.7	21	41.2	35.2	20.6
Soybeans (harvested for beans)						
acres:						7,973
bushels:						116,546
Average bushel/acre:						14.6
Cropland used only for pasture						
acres:	1,322	782	2,728	6,452	1,478	5,431

Table 2.

*Taken from United States Census Reports.

soil is subject to overflows from backwater flooding.

For an example, the soil symbol, 446A1L, is analyzed as follows:

4—The soil was derived from Mississippi River Alluvium and occurs on an old natural levee formation.

4—The soil is moderately well to well drained internally.

6—The surface layer is a loam.

A—The soil has a slope of 1/2-2 percent.

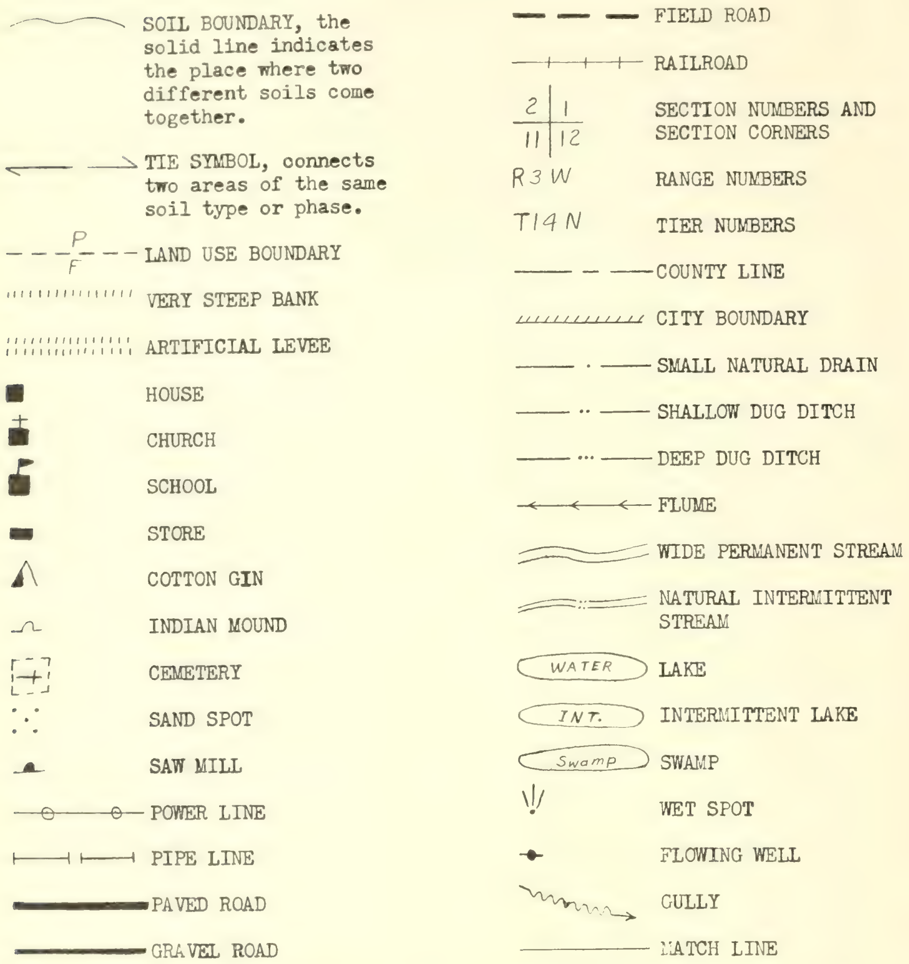
1—The soil is not more than slightly eroded.

L—The soil is being used for the production of cultivated crops.

The diagram on page 11 explains the numbers and letters found on the soil maps.

Entire Soil Profile Important—A soil profile is a cross-sectional view of a soil including its surface, subsoil, and parent material. In studying and classifying soils, the profile must be examined to a depth of 40 inches or more. Often two soils have identical surface layers, but differ widely in the subsoil, and, therefore, have different land uses and agricultural values. The subsoil is a vital part of the soil and it is important that its characteristics be understood. The subsoil regulates such important things as: (1) the rate and amount of water that can pass through the soil; (2) the amount of air in the soil; (3) the water holding capacity of the soil; (4) the depth that taproots may go in search of water; (5) the extent that feeder roots may search beneath the surface layer for plant food; (6) the amount of soil leaching; and (7) the soil temperature which greatly affects the developing root systems and growth in the general of some plants.

Soil Types Vary—It must be understood that the various soil types or mapping units have a range in properties. In other


SOIL BOUNDARY, the solid line indicates the place where two different soils come together.
TIE SYMBOL, connects two areas of the same soil type or phase.
P
F
LAND USE BOUNDARY
VERY STEEP BANK
ARTIFICIAL LEVEE
HOUSE
CHURCH
SCHOOL
STORE
COTTON GIN
INDIAN MOUND
CEMETERY
SAND SPOT
SAW MILL
POWER LINE
PIPE LINE
PAVED ROAD
GRAVEL ROAD
FIELD ROAD
RAILROAD
2 1
11 12
SECTION NUMBERS AND SECTION CORNERS
R3W
RANGE NUMBERS
T14N
TIER NUMBERS
COUNTY LINE
CITY BOUNDARY
SMALL NATURAL DRAIN
SHALLOW DUG DITCH
DEEP DUG DITCH
FLUME
WIDE PERMANENT STREAM
NATURAL INTERMITTENT STREAM
WATER
LAKE
INT.
INTERMITTENT LAKE
Swamp
SWAMP
WET SPOT
FLOWING WELL
GULLY
MATCH LINE

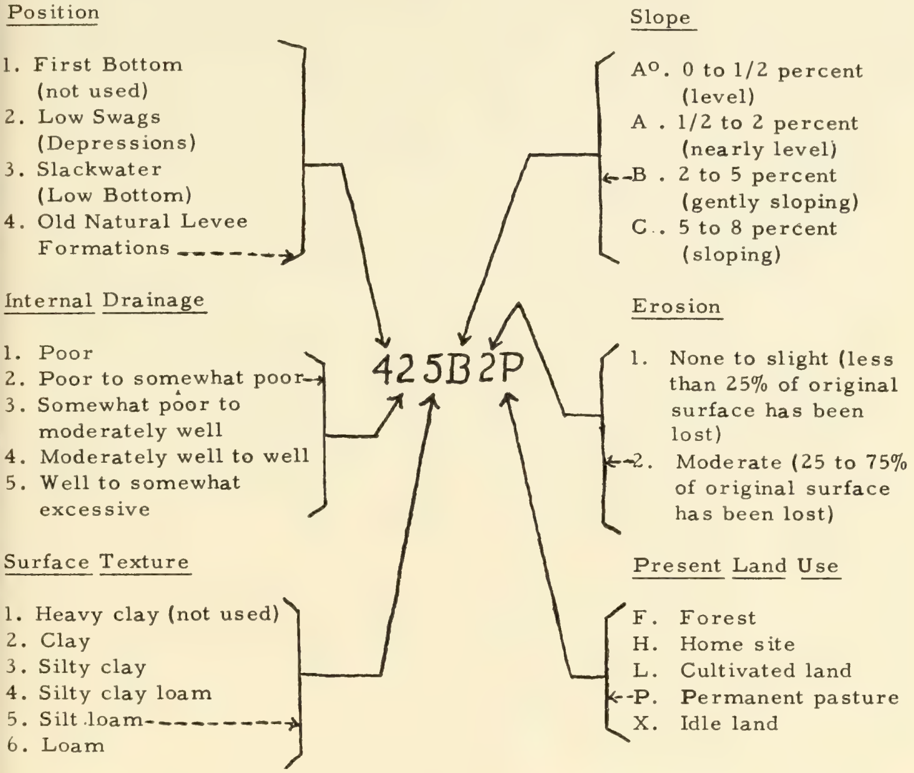
Learn the above list of symbols so that they may be recognized on the soil map

words, the Delta soils are not so uniform that every spot in an area mapped one particular type of soil will be identical. Soils vary the same as cattle. A purebred herd of a dairy breed would be expected to produce more milk and butterfat than a beef herd of the same size. However, it is common knowledge that each cow of the dairy herd will not give exactly the same amount of milk and butterfat. Due to past management and past land use, all of the same soil types will not produce exactly the same crop yields.

Some Good Uses for Your Soil Map

1. Determining Best Land Use—High crop yields year after year are the result of good management. Continued low yields may be caused by poor soil, poor management, or by growing unadapted crops. The first step in producing high yields of any crops is to select land to

Key to numbering and lettering system used in surveying Humphreys County soils.



Position

1. First Bottom (not used)
2. Low Swags (Depressions)
3. Slackwater (Low Bottom)
4. Old Natural Levee Formations

Internal Drainage

1. Poor
2. Poor to somewhat poor
3. Somewhat poor to moderately well
4. Moderately well to well
5. Well to somewhat excessive

Surface Texture

1. Heavy clay (not used)
2. Clay
3. Silty clay
4. Silty clay loam
5. Silt loam
6. Loam

Slope

A°. 0 to 1/2 percent (level)
A . 1/2 to 2 percent (nearly level)
B . 2 to 5 percent (gently sloping)
C . 5 to 8 percent (sloping)

Erosion

1. None to slight (less than 25% of original surface has been lost)
2. Moderate (25 to 75% of original surface has been lost)

Present Land Use

F. Forest
H. Home site
L. Cultivated land
P. Permanent pasture
X. Idle land

Depth Phases

______ Shallow (soil symbol underscored once, indicates that the soil profile rests abruptly upon a clay layer at a depth of 14 to 20 inches).

══════ Moderately shallow (soil symbol underscored twice, indicates that the soil profile rests abruptly upon a clay layer at a depth of 20 to 30 inches.

Overflow Phase

f. Subject to annual overflows (should a lower case "f" occur at the end of the symbol, it shows that the soil is subject to overflows from backwater flooding).

which this particular crop is adapted. This is the basic step upon which the results of the other good applied practices depend. Some soils will produce higher yields of a specific crop than other soils. For example, Dubbs silt loams will produce higher yields of corn than will Alligator clays. The reverse of this is true for rice. Since cotton is still the chief cash crop, the best all-around land on the farm is usually planted to this crop. However, it is important that the remaining soils on the farm be planted to some adapted crop to which the soils' poor physical characteristics are not limiting factors to good yields.

Turn to the index and see the average yields for some locally grown crops that can reasonably be expected with good management for each soil. Five-year records are necessary for good averages because of wide seasonal variations in rainfall, temperature, and insect or disease injury. Unless yearly records are maintained, the high yields are likely to be remembered and the low yields forgotten.

Since new crop varieties, new cultural practices, new plant diseases, and new insect pests may greatly affect yield levels in the future, the yield estimates in the index must be regarded as current.

2. Guide to Drainage—Good drainage is an important factor in obtaining efficient land use for most soils of Humphreys County. However, regardless of how much drainage has been provided, if the crop is not adapted to the soil, low yields may be expected.

The soil map can be a good guide for locating a system of natural surface drainage. The long and usually narrow depressional areas (the soil type numbers 212 and 220) are a part of the natural drainage pattern of each farm. These low swags should be used primarily for the location of drainage ditches and secondarily for the production of some adapted crop. The type and size of ditch used should be governed by the size of the watershed area and the soil types comprising the watershed area. Surface runoff from sandy soils is much less than the runoff from clay soils; therefore, the clay soil areas will require more and larger ditches for adequate drainage. Occasionally, it is necessary to cut ditches across ridges to drain isolated low areas. However, this practice should be avoided as much as possible since the absence of cross ditches results in longer rows essential to mechanized farming.

3. Basis for Field Layout and Row Direction—When practical, field boundaries should be placed on soil boundaries that separate soil types requiring different treatment. Fertilizer application and other management practices suitable for the entire field can then be planned.

Where possible, roads and turnrows should be located on soil boundaries. Roads that cross soil boundaries, rather than follow them, tend to divide the field into smaller units undesirable for mechanized farming. The boundaries of soils on B (2-5%) and C (5-8%) slopes, as well as escarpments and stream banks, are ideal locations for roads.

Row direction is important and should be governed by the soil type, slope of the land, and method of tillage. Soils on level relief, require row direction that allows the best possible runoff. On poorly drained soils the row direction should be such that each row will carry the excess water to an outlet. Of course, this should not be done to the extent that erosion occurs. The fairly well and the well drained soils (soil type numbers where the middle digit is 3, 4, or 5) should have rows running on the contour in order to conserve moisture and prevent erosion. Generally, this means the rows should parallel the natural low swags, natural streams, bayous, and ridges.

The above suggestions usually make it possible to lay out permanent fields with larger areas and longer rows. These long rows over uniform soil tend to make mechanized farming more efficient.

4. Guide in Fertilization—Fertilizer is very important in Humphreys County to

Contour tillage on well drained soils and on gently sloping soils conserve moisture and fertility and protects land against erosion. (Courtesy of S. C. S.)

obtain maximum yields from many crops. However, the number of fertilizer elements needed for the majority of the soils of this county is much smaller than in the upland counties of Mississippi.

Nitrogen has long been recognized as the most lacking plant food in Humphreys County soils. Addition of nitrogen and organic matter to the soil increases the yields for non-legume crops. The mixing of organic matter in soils with undesirable physical characteristics results in easier tillage and higher yields. Properly inoculated legume crops and manure provide a source of both nitrogen and organic matter. Crop residues plowed under are also vital in keeping the soil in a good, mellow condition and in increasing the rate at which it will absorb water. Pasture sods are probably the fastest and best means of increasing the organic matter content. Vetch is well adapted to most soil types of the county. Winter peas are adapted to soils with high clay content (soil types with numbers ending in 2, 3, or 4). However, growing of winter legumes on clay soils to be turned over in the spring is very hazardous. The shallow surface layers of these soils make it very difficult to cover a rank growth of winter legumes well enough for rapid decomposition.

It is considered a good farm practice to break these clayey soils in the fall so that it is not necessary to disturb the seed bed in the spring. Spring breaking of these soils leaves them in a cloddy condition throughout most of the growing season. For these clay soils, a rotation where summer legumes, such as soybeans, are grown for nitrogen and organic matter, is sometimes desirable. Where it is not practical to grow legume crops, a commercial nitrogen fertilizer must be used on all non-legume crops if maximum yields are to be obtained. Depressional areas, where water accumulates from higher surrounding land, maintain a higher nitrogen level and do not require additions of large amounts of commercial nitrogen.

Lime—Most of the soils of Humphreys County are acid (sour). Many crops are acid tolerant—for example, cotton and corn. Clovers and most other legumes grow best on soils that have only a slightly acid, neutral, or slightly alkaline reaction. (Soils with these reactions are usually referred to as sweet). Soils that are acid should receive applications of lime until the reaction reaches the above mentioned sweet condition, if any of the legume crops are to be grown. Where rotations include legumes for nitrogen, an application of lime will usually result in a better growth of inoculated legumes. This in turn, furnishes more nitrogen and organic matter to the soil for the production of the non-legume crops. The amount of lime necessary to bring the reaction up to the desired level for the best growth of legumes depends principally on two factors: (1) sourness and (2) texture of the top soil. Soils with high clay content in the top soil will require much larger applications of lime to bring them to the desired reaction level than sandy soils with the same degree of sourness.

Phosphate and Potash—Experimental work with phosphate and potash fertilizers on most Delta soils has shown little need for these minerals. This does not mean that there are no areas in the county deficient of them. This, also, does not mean that in years to come Delta soild will not be depleted of their phosphate and potash supply. The sediments from which the soils of Humphreys County were formed were fairly rich in these minerals, and the past continuous cotton type farming has removed little of these elements. If a change should occur in the type of agriculture in which more hay, grain, or truck crops would be grown, these elements would be removed from the soil much faster.

Proper soil analysis can serve as a

With the aid of a soils map, a good land use program is being planned for this farm. The map is also invaluable in planning field layout, row direction, location of drainage ditches, and location of field roads. (Courtesy of S. C. S.)

very good indicator of soil fertility. Therefore, when farmers think that their soils may be low in phosphate or potash, or if they decide to lime their land and want to know the approximate amount to apply per acre, they should have their soil tested in the quick-test laboratory at State College, Mississippi.

If the tests show a deficiency in phosphate, potash or lime, the farmer should then apply the recommended fertilizer treatments. The collection of representative soil samples is one of the most important steps in soil testing. Therefore consult some of the agricultural workers in the county regarding how to collect your samples for soil analysis.

The following fertilizer recommendations for cotton, corn, soybeans, and home gardens, and the pasture recommendations (Table 3) were based on the Mississippi Agricultural Experiment Station Circular No. 194, "1955 Crop and Fertilizer Recommendations for Mississippi."

Cotton

1. Apply 75 to 100 pounds of nitrogen prior to planting to the silt loams and loams (soil types ending in 5 or 6) and 100 pounds prior to planting to the clay, silty clay, and silty clay loam soils (soil types ending in 2, 3, or 4). Sandy loam soils with very good to excessive internal drainage (soil type 456 in this county) should have 40 to 45 pounds of nitrogen prior to planting and 40 to 45 pounds as a side dressing.
2. Where a good growth of winter legumes is turned under, little additional nitrogen is needed. If poor stands or a poor growth prevails, commercial nitrogen should be applied accordingly.
3. If nitrogen is to be applied as a sidedressing, make application immediately after the cotton is cleaned out for the first time.
4. Apply anhydrous ammonia 6 to 8 inches deep on loamy soils and 5 to 6 inches deep or as deep as conditions will permit on gumbo or buckshot soils. The anhydrous ammonia must be sealed in the soil. Apply solid materials as deep as practical with available equipment.
5. Apply phosphate and potash on a trial basis only, except where beneficial results have been established. Have soils analyzed to indicate need for trials.

Corn

1. Apply 120 pounds of nitrogen per acre.
2. Place nitrogen as deep as practical with available equipment. (A depth of at least 6 inches is desirable).
3. Apply nitrogen prior to planting or in split applications. With split application, apply one-half of the nitrogen before planting and one-half as side dressing. The practice of applying all of the nitrogen before planting usually saves at least one cultivation.
4. Leave approximately 12,000 corn plants per acre. If corn is planted in checks, leave three stalks per hill; or, if corn is drilled, leave corn spaced about 14 to 15 inches apart.

Soybeans

Use no fertilizer except on a trial basis or where beneficial effect has been established.

Home Garden

When barnyard manure is available, apply 40 pounds per 100 square feet—disc in well and apply 4 pounds of 5-10-5 or 6-8-8 per 100 linear feet of row. With no manure, double rate of commercial fertilizer. Since many parts of Humphreys county require no phosphate or potash, more accurate recommendations can be made by soil tests. In addition to the fertilizer applied before planting the garden, such crops as broccoli, cabbage, cauliflower, collards, sweet corn, cucumbers, cantaloupes, egg-plant, lettuce, mustard, okra, peas, pepper, potatoes, spinach, squash, tomatoes, and watermelons should be sidedressed with a nitrogen-carrying fertilizer such as ammonium nitrate or sodium nitrate, applied at the rate of 1 pound and 2 pounds per 100 linear feet of row, respectively.

Table 3. Delta Pasture and Grain Crops Recommendations

Pasture Crop	Recommended varieties	Rate of seeding per acre	Fertilizer	Time of planting
Alfalfa	Buffalo Kansas Common Okla. Common	10-20 lbs.	Test soil for lime, phosphorus, and potash	Oct. 1-15
Bermuda grass	Common, Coastal	5 lbs. or sprig	60 lbs. nitrogen	Mar. 1-May 1
Dallis grass	Imported or Domestic	10 lbs. live seed	30 lbs. nitrogen after germination	Oct. 1-Nov. 1
Fescue and Ladino	Kentucky 31	5-10 lbs. Fescue 1-2 lbs. Ladino	30 lbs. nitrogen at planting 60 lbs. for winter grazing	Oct. 1-Nov. 1 Feb.-May 1
Red Clover	Kenland Common	10-15 lbs. seed alone or in small grains	Test soil for lime, phosphorus, and potash	Oct. 1-Nov. 1
Ladino clover		1-2 lbs. seed with grass	Test soil	Oct. 1-Nov. 1
White clover		2-4 lbs. seed with grass	Test soil	Oct. 1-Nov. 1
Crimson clover	Hard seeded for volunteer crop	12-15 lbs.	Test soil for lime, phosphorus and potash	Oct. 1-Nov. 1
Sudan grass	Tift Sweet	6-10 lbs. in 38 to 40 inch rows	60 lbs. nitrogen	June 1-20
Lespedeza	Korean or Climax	20-25 lbs. seed in small grains		Feb. 15-Mar. 15
Grain sorghum	Martin	10 lbs. in 38 to 40 inch rows	30-45 lbs. nitrogen	June 1-July 1
Oats	Delta Red 88, Nortex 107 Fulgrain, Arlington Mustang, Delair Madison Co. Red Victorgrain 48-93	3 bu. 2-1/2 bu. for grain	60 lbs. in Sept. for winter grazing 45-60 lbs. Feb. 20-Mar. 15 for grain	For grazing, early September For grain, mid-October
Ryegrass	Annual	25-30 lbs.	60 lbs. nitrogen	Sept. 1-30
Wheat	Chancellor, Atlas 66 Coker 47-27	1-1/4 bu. for grain 1-1/2 bu. for grazing	Same as oats	Same as oats
Johnson grass & red clover mixture		10-15 lbs. spring 10 lbs. fall	60 lbs. nitrogen	April 1-June 1 Oct. 1-Nov. 1 after Johnson grass established

Table 4. Monthly water requirements for optimum plant growth at Stoneville, Mississippi.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
.45	.64	1.05	2.70	4.59	6.19	7.01	6.34	4.90	2.50	1.04	.51

Table 5. Number of years there is a rainfall deficiency out of 22 at Stoneville, Mississippi.

Month						
May	June	July	August	Sept.	Oct.	Dec.
2	11	17	21	19	9	2

*A deficiency occurs when rainfall and soil-moisture reserve are less than water requirements for optimum plant growth. The average rainfall deficiency for the 22 year period (1930-1951) at Stoneville was 9.78 inches. Had the dry three (3) year period of 1952-1954 been included, the average would have been higher. The rainfall deficiency and optimum plant growth for Stoneville and Humphreys County are similar.

5. Guide in Irrigation[1]—Droughts of sufficient duration to reduce yields of summer pastures and row crops occur frequently in Humphreys County. Perennial pasture crops suffer severely most years during mid- and late-summer from high temperatures and moisture deficiencies. Corn planted the first half of April is usually far enough advanced to make good yields, except when drought occurs during the months of June or July. Late-planted corn suffers from drought almost every year. Cotton yields are reduced some years on sandy land, but infrequently on clay or mixed land. Serious reductions in yield occurred in 1952 and 1954 for all crops and in 1953 for many crops.

Irrigation of row crops and pastures is in the experimental stage with good possibilities for the future. Rice irrigation has been successful.

Whether furrow or sprinkle type of irrigation is used is determined by the general slope and the lay of the land. Some soils can take more water at an application than others due to differences in permeability and organic matter content. Some soils require water applications more often than others due to differences in water-holding capacities. Therefore, the type of irrigation used, the amount of water used per application, and the number of applications required are directly dependent upon the type of soil and the way it lays.

With the type of irrigation required for rice production, the subsoil is an important factor. There must be a subsoil layer in the soils planted to rice which will retard or prevent the downward movement of water. The Alligator, Dowling, and Iberia soils greatly retard the downward movement of water and are ideal for this type of irrigation. It can also be practiced on Forestdale soils without serious loss of water.

Most of the soils of Humphreys County, with the exception of the soils that occur on steep slopes, may be successfully irrigated for pasture production and several soils may be successfully irrigated for row crop production. Should you plan to irrigate pastures and row crops, keep the following points in mind:

Irrigate the crops as they need it. Once the ground is badly cracked it is difficult and costly to seal these cracks, and the plant root systems have already been damaged. Often row crops start a second growth after irrigation when it has been delayed for a long period of time. This second growth usually reduces the yields of these crops.

Use a system of irrigation where several inches of water can be applied in a fairly short period of time so that it will be comparable to a normal, good rain. Irrigating with only small amounts of water usually gives no beneficial results.

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[1] Some of the material on "Irrigation" has been adapted from Mississippi Agricultural Experiment Station Circular No. 180, "Crop Response to Irrigation in Mississippi."

Regardless of the crop you plan to irrigate, be sure to have an abundant source of water before making definite plans for irrigation. When several farmers are irrigating large areas with water from the same lake or small stream, the water supply is sometimes exhausted during dry seasons.

6. Pointing out the Specific Problems of Your Soils—Most farms have soils that vary widely in adaptability to different crops. Some of the soils may be excellent pasture land, but a poor risk for cotton production. By using the soil map as a guide, the soils adapted to similar crops and requiring similar management practices may be blocked off and put to the same land use.

Each soil condition has problems that may or may not be general in all of your soils. All may have the same surface texture; but the internal drainage could vary from poor to excellent. This variability can affect crop adaptation. On the other hand, the internal drainage may be the same on all of your soils, but surface textures may vary widely. These variations can affect the choice of crops and methods of tillage.

Slopes of the different soils may cause problems in row directions, field boundaries, and surface drainage. The stronger slopes present erosion problems, whereas the almost flat slopes present problems of adequate drainage.

Many fields in Humphreys County have two or more soils with widely varying characteristics that require different types of crops and management. When the area of one soil is very small it is often necessary to farm it the same as the surrounding type or types. Otherwise, each soil type can be managed separately and put to its best land use.

Soil Management Groups Of Humphreys County—Their Use And Management

The soils of Humphreys County have been placed into thirteen separate "Use and Treatment" groups. The soils within each group are similar in profiles, drainage, and relief, and degree of erosion. They are adapted to similar crops and need like treatment and management.

The row direction of groups 1 and 3 follow the ridges and depressions, generally on the contour, to conserve soil, moisture, and fertility. The rows are on the contour in groups 2, 6, 7, and 8 in order to prevent further erosion. In groups 4, 5, and 9 the row direction is planned so that each row will carry its own water to a proper outlet, but not to the extent that erosion occurs. The row direction of all other groups is to give maximum surface drainage.

Little, if any, artificial surface drainage is needed for groups 1 and 3 because of their fairly permeable subsoils. No surface drainage is needed for groups 2, 6, 7, and 8 because of their gently sloping relief. Some surface drainage in the form of W-type ditches, located in the low areas of the field emptying into larger outlets, is needed for groups 4 and 5. An extensive system of W- and V-type ditches is needed for all other groups. Groups 10 and 13 (the low swags) are part of the natural drainage pattern of the area in which they occur and can be used advantageously for the location of secondary and primary drainage ditches.

Compacted areas (plow-soles) occur occasionally in groups 1, 2, 3, 4, 6, and 7. These areas are usually 2 to 6 inches thick and occur just below the plow layer. When found, they should be broken or shattered during the dry late fall months. This practice is called subsoiling. The cracking of the clayey soils (groups 8, 9, 12, and 13) during extreme dry weather is nature's own way of subsoiling, and other methods have not given any significant results on these groups.

Fall plowing of loamy soils (groups 1, 2, 4, and 7) is a farm practice that has little merit other than possibly helping to control insects for the following year. On the other hand, erosion hazards caused by this practice can be very costly in terms of valuable topsoil lost during the winter months of normally high rainfall.

Fall breaking of level and nearly level clayey soils (groups 9 and 12) is considered desirable. Spring breaking of these soils often leaves them cloddy throughout the growing season.

Group 1 may be used for continuous non-legume row crops, such as cotton, if winter legumes are grwn annually. Non-legume row crops may be grown on groups 2, 3, 4, and 5 for two years out of four or three years out of every six; on groups 6, 7, 8, 9, and 10 for one year out of three; and on groups 11, 12, and 13 for about one year out of six (it is sometimes desirable to leave these soils in forest). It is suggested that the non-legume row groups be grown in rotation with grass and legume sods or summer legumes.

Soils of this county respond well to applications of nitrogen and organic matter. After the soils have been clean cultivated, probably pasture sods are the fastest and best means of increasing their organic matter content.

During the period of June 29-July 12, 1954, both surface and subsoil samples were collected from 200 different locations, carefully selected, so as to be representative of the soils of Humphreys County. Modal soil types, based on soil maps previously made by the survey party, were sampled without consideration being given to "good" or "poor" crops. No samples were taken from fields with a slope gradient of more than 2 per cent, since stronger slopes are not representative of the county's relief. All of the samples were collected from cultivated fields. The samples were sent to the Soil Testing Laboratory at State College, Mississippi, for analysis. The results are in Table 6.

Group 1. (Land-Capability Class I)*

Description of Land

General: Somewhat poorly to well-drained, none to slightly eroded, loamy soils on nearly level relief (½-2% slopes).

Surfaces: The surfaces are grayish-brown to pale-brown silt loams and loams, ranging from 5 to 8 inches in thickness. They work easily, but rain causes them to crust when bare.

Subsoils: The slightly mottled to mottle-free, brown subsoils range in texture from silty clays to silt loams, but allow good movement of water and air through them and fairly deep root penetrations.

Position: These soils occur in small to fairly large areas on the highest altitudes of the old natural levee formations.

Per cent of county: Approximately 6 per cent.

Group consists of: 035A1, 435A1, 436A1, 445A1, 446A1, and 456A1.

Use and Treatment

Surface drainage: Row direction usually follows the ridges and depressions, generally on the contour, to conserve soil, moisture, and fertility. Little, if any, artificial drainage is needed.

Subsoiling: Compacted areas (plowsoles) occur occasionally in this group of soils. These layers are usually 2 to 6 inches thick and occur just below the plow layer. When found, they should be broken during dry weather in the late fall months.

Adapted crops: This is excellent land for most row crops, truck crops, orchards, small grains, hay crops, grasses, and legumes commonly grown in this county. It is not well adapted to such crops as rice which require flood-type irrigation. It is well adapted to timber and wildlife but is seldom used for these purposes.

Rotations: When used for continuous non-legume row crops, such as cotton, the growing of winter legumes annually helps maintain the good tilth and high fertility level. These are the most productive and best all-round agricultural

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*See discusion of Land Capability Classes beginning on page 28.

Table 6. Quick-test data for Humphreys County.

Soils Sampled	I[1]		II[2]		III[3]		IV[4]	
Number of sample locations	39		72		44		45	
	Surface %	Subsoil %	Surface %	Subsoil %	Surface %	Subsoil %	Surface %	Subsoil %
SOIL REACTION: (pH)								
Neutral	2				4		2	
Slightly acid	8	2	4	4	7	2	7	5
Medium acid	46	23	29	15	18	16	38	13
Strongly acid	36	46	39	25	48	34	44	46
Very strongly acid	5	29	26	52	21	43	9	29
Extremely strongly acid	3		2	4	2	5		7
PHOSPHATE: (Avail P_2O_5 per acre)								
Very low (0-30 lbs.)		5		11		11		4
Low (31-62 lbs.)	5	15	3	11		14		20
Slightly low (63-100 lbs.)	13	21	15	31	7	9	11	38
Medium (101-160 lbs.)	44	31	39	25	39	55	13	31
High & very high (161-367 lbs.)	38	28	43	22	54	11	76	7
POTASH: (Water soluble and exchangeable potassium)								
Very low		10		21	2	2		
Low	3	21	7	40		25	2	5
Slightly low	59	69	79	38	41	63	7	48
Medium	33		10	1	46	10	22	42
High	5		4		11		69	5

[1] These samples were collected from the following soils: 435A1L, 035A1L, 445A1L, 446A1L, 436A1L and 456A1L.

[2] These samples were collected from the following soils: 425A1L, 025A1L. and 426A1L.

[3] These samples were collected from the followings soils: 314A1L, 424A1L.

[4] These samples were collected from the following soils: 312A1L, 312A°1L, 423A1L, and d312A1L.

soils of the county, and with good management, may be expected to produce high yields continuously.

Fall plowing of these loamy soils is a commonly found farm practice. It has little value, other than possibly helping to control insects. On the other hand, erosion hazards caused by this practice can be very costly in terms of valuable topsoil lost during the winter months of normally high rainfall.

Fertility: These soils respond well to additions of nitrogen and organic matter. They are usually medium or strongly acid in reaction. Quick test results indicate that some areas of these soils are slightly low in available phosphate and available potash.

Group 2. (Land-Capability Class IIe1)

Description of Land

General: Somewhat poorly to well-drained, slightly to moderately eroded, loamy soils on gently sloping relief (2-5% slopes).

Surfaces: The surfaces are grayish-brown to pale-brown silt loams and loams, ranging from 4 to 6 inches in thickness. They work easily, but rain causes them to crust when bare.

Subsoils: The slightly mottled to mottle-free, brown subsoils range in texture from silty clays to sandy clay loams, but allow good movement of water and air through them and fairly deep root penetrations.

Position: These soils occur in narrow but fairly long bands along some present or former stream channel. They occupy some of the stronger slopes of the old natural levee formations.

Percent of county: Approximately 1 percent.

Group consists of: 435B1, 435B2, 436B1, 436B2, 445B1 445B2, 446B1, 446B2, and 456B1.

Use and Treatment

Surface drainage: Row direction should follow the contour to prevent further erosion and to conserve moisture and fertility. No artificial drainage is needed.

Subsoiling: Compacted areas (plow-soles) occur occasionally in this group of soils. These areas are usually 2 to 6 inches thick and occur just below the plow layer. When found, they should be broken during dry weather in the late fall months.

Adapted crops: This is very good to excellent land for most row crops, small grains, grasses, and legumes commonly grown in this county. Timber production and wildlife are also adapted.

Rotations: When used for continuous non-legume row crops, such as cotton, the growing of winter legumes annually helps maintain the tilth and fertility level. A rotation that includes close growing or grass and legume sod crops for 2 out of every 4 years is suggested if the area is large enough for practical separation from rest of field. Fall plowing of these soils makes the hazards of erosion great during the winter months.

Fertility: These soils respond well to additions of nitrogen and organic matter. They are usually medium or strongly acid in reaction. Quick test results indicate that some areas of these soils are slightly low in available phosphate and potash.

Group 3. (Land-Capability Class IIs1)

Description of Land

General: Somewhat poorly and moderately well-drained, none to slightly eroded, mixed soils on nearly level relief (½-2% slopes).

Surfaces: The surfaces are grayish-brown silty clay loams, ranging from 4 to 6 inches in thickness. There is enough clay present to make the soils sticky and plastic when wet, and hard when dry.

Subsoils: The mottled brown subsoils are silty clay textured, but allow fairly good movement of water and air through them. Root penetrations into the subsoil are fairly deep.

Position: These soils occur in small areas on the old natural levee formations.

Percent of county: Less than 1 percent.

Group consists of: 434A1.

Use and Treatment

Surface drainage: Row direction usually follows the ridges and depressions. Little artificial drainage is needed.

Subsoiling: When compacted areas (plow-soles) occur just under the plow layers, they should be broken during dry weather in the late fall months. However, these compacted areas do not occur as frequently in this group of soils as they do in group 1.

Adapted crops: This is very good to excellent land for the production of most row crops. It is excellent land for most grass and legume mixtures of this area.

Rotations: These productive soils usually produce good yields continuously when winter legumes are grown annually. However, for maximum yields and best soil improvement, summer legumes or grass and legume sods should be grown for 3 out of every 6 years.

Fertility: These soils respond well to additions of nitrogen and organic matter. They are usually medium or strongly acid in reaction. Quick test results indicate that some areas of these soils are slightly low in available phosphate and available potash.

Group 4. (Land-Capability Class IIs2)

Description of Land

General: Poorly and somewhat poorly drained, none to slightly eroded, loamy soils on nearly level relief (½-2% slopes).

Surfaces: The surfaces are light-gray to light brownish-gray silt loams and loams, ranging from 5 to 7 inches in thickness. They work easily, but rain causes them to crust when bare.

Subsoils: The highly mottled gray to light brownish-gray subsoils range in texture from silty clays to silt loams. The silt loam subsoils are scattered along Silver Creek and Straight Bayous. Because of the high clay and silt content of these subsoils, water and air move slowly through them and root penetrations are shallow.

Position: These soils occur in small to large areas on the lower elevations of the old natural levee formations.

Percent of county: Approximately 15 percent.

Group consists of: 025A1, 425A1, 426A1 and 425A°1.

Use and Treatment

Surface drainage: The row direction should be such that each row will carry its excess water to a proper outlet, but the fall for each row must be small enough to prevent erosion. Some surface drainage is usually needed. A system of W- and V-type ditches located in the lowest areas of the field and emptying into proper water outlets is usually sufficient.

Subsoiling: Compacted areas (plowsoles) occur occasionally in this group of soils. These areas are usually 2 to 6 inches thick and occur just below the plow layer. When found, they should be broken during dry weather in the late fall months.

Adapted crops: This is good to very good land for most row crops, small grains, hay crops, grasses, and legumes grown locally. Forest and wildlife are well adapted to this land. Flood-type irrigation for rice and pastures may be practiced on these soils without serious loss of water.

Rotations: Non-legume row crops should be followed by winter legumes. It is suggested that grass and legume sods or summer legumes be grown 3 out of every 6 years in order to maintain the fertility level and to improve the physical features of these soils. Fall plowing of these loamy soils makes the hazards of erosion great during the winter months.

Fertility: These soils respond well to additions of nitrogen and organic matter. They range in soil reaction from medium acid to very strongly acid. Quick test results indicate that several areas of these soils are slightly low in available phosphate and available potash.

Group 5. (Land-Capability Class IIs3)

Description of Land

General: Poorly and somewhat poorly drained, none to slightly eroded, mixed soils on nearly level relief (½-2% slopes).

Surfaces: The surfaces are grayish-brown silty clay loams, ranging from 4 to 5 inches in thickness. The clay content is high enough to give these soils less desirable tilth than the loamy groups. These soils are sticky and plastic when wet and very hard when dry.

Subsoils: These soils have highly mottled gray silty clay and clay subsoils through which water and air move slowly and root penetrations from crops are shallow.

Position: These soils occur in small to fairly large areas usually in the transitional zone between clayey and loamy soils; or, they occur on low old natural levees that have formed to the many shallow old stream channels scattered throughout the large areas of clayey soils.

Percent of county: Approximately 14 percent.

Group consists of: 314A1, 424A1.

Use and Treatment

Surface drainage: The row direction should be such that each row will carry its excess water to a proper outlet, but the fall for each row must be small enough to prevent erosion. Some surface drainage is usually needed. A system of W- and V-type ditches located in the lowest areas of the field and emptying into proper water outlets is usually sufficient.

Subsoiling: The cracking of these soils during extreme dry weather is nature's way of subsoiling. Generally, other types of subsoiling on this group of soils have not given significant results.

Adapted crops: This land is fair to very good for most locally grown row crops. It is well adapted to fescue and white clover, Dallis-grass and lespedeza, or Johnson grass and red clover. Flood-type irrigation for rice and pastures may be practiced on these soils without serious loss of water.

Rotations: These soils should be in grass and legume sods or summer legumes for at least 50 percent of the time in order to maintain the fertility level and to improve the physical conditions of the land. Where the land is needed for cotton production, any of the following rotations are sound: grass and legume pasture sods for three years, cotton for three years; soybeans for two years, cotton for two years; oats followed by lespedeza for two years, cotton for two years. Corn and other non-legume row crops may be substituted for cotton.

Fertility: These soils respond well to additions of nitrogen and organic matter. They range in soil reaction from medium to very strongly acid with about 50 percent of them being strongly acid. Quick test results indicate that some areas of these soils are low in available phosphate and slightly low in available potash.

Group 6. (Land-Capability Class IIIe2)

Description of Land

General: Somewhat poorly and moderately well drained, slightly and moderately eroded, mixed soils on gently sloping (2-5%) and sloping (5-8%) relief.

Surfaces: The surfaces are grayish-brown silty clay loams, ranging from 3 to 5 inches in thickness. There is enough clay present to make the soils sticky and plastic when wet and hard when dry.

Subsoils: The mottled brown subsoils are silty clay textured, but allow fairly good movement of water and air through them. Root penetrations into the subsoil are fairly deep.

Position: These soils occur in narrow bands on some of the stronger slopes of the old natural levee formations.

Percent of county: Less than 1 percent.

Group consists of: 434B1, 434B2, and 434C2.

Use and Treatment

Surface drainage: Row direction should follow the contour to prevent further erosion and to conserve moisture and fertility. No artificial drainage is needed.

Subsoiling: When compacted areas (plow-soles) occur just under the plow layers, they should be broken during dry weather in the late fall months. However, these compacted areas occur much less frequently in this group of soils than in the loamy group.

Adapted crops: This is fair to very good land for most locally grown row crops, small grains, grasses, and legumes.

Rotations: A rotation that includes close growing or sod crops for two out of every three years is suggested if the area is large enugh for practical separation from rest of field. The sloping areas of these soils should be in permanent cover and never in row crops.

Fertility: These soils respond well to additions of nitrogen and organic matter. They are usually medium or strongly acid in reaction. Quick test results indicate that some areas of these soils are slightly low in available phosphate and potash.

Group 7. (Land-Capability Class IIIe3)

Description of Land

Poorly and somewhat poorly drained, slightly and moderately eroded, loamy soils on gently sloping (2-5%) and sloping (5-8%) relief.

Surfaces: The surfaces are light-gray to light brownish-gray silt loams and loams, ranging from 4 to 6 inches in thickness. They work easily, but rain causes them to crust when bare.

Subsoils: The highly mottled gray to light brownish-gray silty clay subsoils cause water and air to move slowly through them and plant root penetrations to be shallow.

Position: These soils occur in long narrow bands on some of the strongest slopes of the old natural levee formations.

Percent of county: Approximately 1%.

Group consists of: 425B1, 425B2, 425C2, 426B1, 426B2, and 426C2.

Use and Treatment

Surface drainage: The row direction should follow the ridges and depressions, on the contour, to prevent further erosion. No improvised drainage is needed.

Subsoiling: Compacted areas (plowsoles) occur occasionally in this group of soils. These areas are usually 2 to 6 inches thick and occur just below the plow layer. When found, they should be broken during dry weather in the late fall.

Adapted crops: These soils are fair to very good for most locally grown row crops, small grains, hay crops, grasses, and legumes. Pasture sods and close growing crops are preferable uses.

Rotations: If land is needed for non-legume row crops, they should be followed by winter cover crops. These soils should be in pasture sods or close growing summer legumes for 2 out of every 3 years when the areas are large enough for practical separation from rest of field. Row crops should never be planted on the sloping areas. Fall plowing of these soils makes the hazards of winter erosion great.

Fertility: These soils respond well to additions of nitrogen and organic matter. They range in soil reaction from medium to very strongly acid. Quick test results indicate that several areas are slightly low in available phosphate and potash.

Group 8. (Land-Capability Class IIIe4)

Description of Land

General: Poorly and somewhat poorly drained, slightly and moderately eroded, clayey and mixed soils on gently sloping (2-5%) and sloping (5-8%) relief.
relief.

Surfaces: The surfaces are dark grayish-brown and grayish-brown clays, silty clays, and silty clay loams, ranging from 2 to 4 inches in thickness. Because of the high clay content, these soils are sticky to very sticky when wet and very hard when dry.

Subsoils: These soils have highly mottled gray to light brownish-gray clay and silty clay subsoils through which water and air move slowly and root penetrations are shallow.

Position: These soils occur on the stronger slopes in the clayey (slackwater) areas and on the slope of some old natural levee.

Percent of county: Approximately 2%.

Group consists of: 312B1, 312B2, 312C2, 314B1, 423B1, 424B1, 424B2, and 424C2.

Use and Treatment

Surface drainage: The row direction should generally parallel the ridges, on the contour, to prevent further erosion. Due to the slope, the excess surface water accumulates in the lower areas (usually the low swags) of the fields. These low swags should have a system of V- and W-type ditches located in them to give adequate drainage.

Subsoiling: The cracking of these soils during extreme dry weather is nature's way of subsoiling. Other types of subsoiling have not given significant results.

Adapted crops: This land ranges from poor to fair for most locally grown row crops. It is fairly well adapted to most grasses and shallow rooted legumes of this area. Oats do well, but in some years water from the overfilled adjacent depressions drowns out oats on the lower parts of these slopes.

Rotations: Where this land is needed for non-legume row crops, it is suggested that pasture sods or close growing summer legumes be grown for four out of every six years on this land. The gently sloping areas of this land is often planted to rice with the surrounding soils. A rotation in which rice is grown for two or three years and grass and legume sods for three years is sound. Pastures, rice, oats, and soybeans are probably some of the surer crops. Permanent cover is desirable for the sloping areas.

Fertility: These soils respond well to additions of nitrogen and organic matter. They range in soil reaction from medium to very strongly acid with about 50 percent of them being strongly acid. Quick test results indicate that some areas of these soils are slightly low to low in available phosphate.

Group 9. (Land-Capability Class IIIs2)

Description of Land

General: Poorly drained, none to slightly eroded, clayey soils that occur on nearly level relief (½-2% slopes).

Surfaces: The surfaces are dark grayish-brown and grayish-brown clays and silty clays, ranging from 2 to 4 inches in thickness. The tillage of these soils is difficult, since their high clay content causes them to be very sticky and plastic when wet and very hard with numerous cracks when dry. For row crops the best results are generally obtained when the soils of this group are broken and prepared in the fall. Spring breaking often leaves soils cloddy throughout the growing season.

Subsoils: These soils have highly mottled gray clay subsoils through which water and air move slowly and plant root penetrations are shallow.

Position: These soils occur in small to large areas in the slackwater areas.

Percent of county: Approximately 24%.

Group consists of: 312A1, d312A1, 423A1.

Use and Treatment

Surface drainage: Row direction should be such that each row will carry the excess water to adequate outlets. Of course, this should not be done to the extent that erosion occurs. Extensive drainage systems are necessary to remove excess surface water from these soils. W- and V-type ditches emptying into larger ditches give the best results.

Subsoiling: The large cracks that occur in these soils during extreme dry weather is nature's way of subsoiling. Generally, other types of subsoiling on this group have not given significant results.

Adapted crops: This land is well adapted to rice, hay crops, and grasses and fairly well adapted to soybeans. When the surface drainage is good, oats do well. For some row crops, such as cotton or corn, only occasionally good yields are obtained. The organic matter contained in these soils when first cleared is reflected in their yields and water intake for the first three years of cultivation.

Rotations: When this land is used for non-legume row crops, it is suggested that a rotation be used which includes grass and legume sods or summer legumes for 4 out of every 6 years. This is necessary in order that the fertility level may be maintained and that the physical conditions of the soil may be improved. Growing winter legumes for green manure on these soils is hazardous since this practice requires the preparation of the seed bed in the spring. Rotations in which rice is rotated with pastures or soybeans show good promise for this type land. Rice, pastures, oats (where there is good surface drainage), hay crops, and soybeans are crops that involve less risk of failure.

Fertility: These medium to strongly acid soils respond well to additions of nitrogen and organic matter. Quick test results indicate that a few areas of these soils are slightly low in available phosphate and most of the soils are medium or high in potash.

Group 10. (Land-Capability Class IIIw3)

Description of Land

General: Poorly drained mixed soils that occur in low swags (depressions). These soils accumulate rather than erode.

Surfaces: Soil materials washed down from the surrounding higher land cause the surfaces to range widely in color, texture, and thickness. The texture ranges from clays to silt loams; the thickness ranges from 3 to many inches.

Subsoils: These soils have mottled dark-gray clayey subsoils through which water and air move slowly and plant root penetrations are shallow.

Position: These soils occur in low swags scattered throughout the loamy and mixed soils.

Percent of county: Approximately 6 per cent.

Group consists of: 220.

Use and Treatment

Surface drainage: Row direction usually parallels these narrow low swags. The low position and clay subsoils always necessitate improvised surface drainage before these soils can be properly used for field crops. These low swags are part of the natural drainage pattern of the area in which they occur and should be used primarily for the location of V- and W-type drainage ditches and secondarily for crop production.

Subsoiling: Subsoiling of these soils has not given significant results.

Adapted crops: Cotton and corn production involves a certain amount of risk on these soils. However, due to their small size, they are usually farmed the same as the adjacent soils. With proper drainage this land is adapted to the growing of soybeans, hay crops, silage crops, and summer temporary grazing crops.

Rotations: These narrow areas are usually too small in size to separate from the other soils and put to different land uses. Therefore, they are usually put in the same rotation as the surrounding soils.

Fertility: These soils have accumulated fertility from adjacent higher land and are usually some of the most fertile spots of the field. However, local flooding prevents them from being the most productive. Generally less nitrogen is required for these soils than the surrounding higher land.

Group 11. (Land-Capability Class IVw1)

Description of Land

General: Overflow soils on level (0-½ %), nearly level (½-2%), and gently sloping (2-5% slopes) relief.

Surfaces: Clays, silty clays, silty clay loams, and silt loams, occur in these areas with the clay surfaces occupying by far the largest total area.

Subsoils: These highly mottled gray subsoils are high in clay and silt content. Because of this clay and silt content, water and air move slowly through them and plant root penetrations are shallow.

Position: These soils occur in areas subject to annual backwater flooding caused by the overflowing of the Yazoo and Sunflower Rivers or some of their small tributary bayous and lakes.

Percent of county: Approximately 19 percent.

Use and Treatment

Surface drainage: These soils are sometimes covered by overflow water for several weeks during the winter and spring months.

Adapted crops: Until the overflows are eliminated, trees are probably the best land use. The overflow water often does not recede in the spring until the desired planting dates for many crops, such as cotton and corn, have been passed. Where cleared, soybeans, milo, and millet or sudan grass are sometimes grown with variable results. Wild volunteer grass is often cut for hay. Some years cotton crops are grown. In other years after cotton has been planted and cultivated a few times, the overflow water comes and drowns the cotton.

Fertility: These soils respond to applications of nitrogen or non-legume crops. The soil reaction ranges from medium acid to strongly acid. In areas where the native vegetation has not been cleared, usually a mat of duff (partly decomposed organic matter), ranging from 1 to 3 inches in thickness, covers these soils. When the overflow water is controlled, these soils will probably reflect this organic matter by producing higher yields and by having better intake of water during the first few crop years after clearing.

Group consists of: If and when the overflows have been eliminated, the following soils will respond as follows:

425Af and 426Af will be managed similar to soil group 4.

424Af and 314Af will be managed similar to soil group 5.

425Bf will be managed similar to soil group 7.

424Bf and 312Bf will be managed similar to soil group 8.

312Af will be managed similar to soil group 9.

220f will be managed similar to soil group 10.

312A°f will be managed similar to soil group 12.

212f will be managed similar to soil group 13.

012Ff is an undifferentiated group of soils. It includes 312 Af, 312A°f, and 212f.

300Ff is an undifferentiated group that may include any or all of the other soils found in this group.

Group 12. (Land-Capability Class IVw2)

Description of Land

General: Very poorly drained clayey and mixed soils on level relief (0-½% slopes). Little, if any, erosion has occured.

Surfaces: The surfaces are dark grayish-brown and grayish-brown clays, silty clays, and silty clay loams, ranging from 2 to 5 inches in thickness. Because of the high clay content, these soils are sticky to very sticky when wet and very hard when dry.

Subsoils: These soils have highly mottled gray clay and silty clay subsoils through which water and air move very slowly and root penetrations are shallow.

Position: These soils occur in the flat slackwater areas.

Percent of county: Approximately 5 percent.

Group consists of: 312A°l, 314A°l, and 424A°l.

Use and Treatment

Surface drainage: Row direction must be such that maximum drainage of excess surface water may be had. An extensive system of artificial drainage in the form of W- or V-type ditches must be established before these soils can be used for row crops.

Subsoiling: The large cracks that occur in these soils during extreme dry weather is nature's way of subsoiling. Generally, other types of subsoiling on this group have not given significant results.

Adapted crops: With good improvised surface drainage, this land is fairly well adapted to hay crops and locally grown pasture mixtures (such as fescue and white clover or Dallisgrass and lespedeza). It is well adapted to rice and forest.

Rotations: This land is not recommended for cotton, corn, or oats. Rotations where rice is rotated with pasture or soybeans show promise.

Fertility: These soils respond well to additions of nitrogen and organic matter. The majority of this land is medium acid or strongly acid in reaction. Quick test results indicate that many of these soils are slightly low or low in available phosphate. However, most field experiments have not given increased yields on this land from the application of phosphate. Available potash is medium to high in almost all of these soils.

Group 13. (Land-Capability Class IVw3)

Description of Land

General: Very poorly drained clays in low swags (depressions). The soil accumulates rather than erodes.

Surfaces: The surfaces are very dark-gray clays but range in thickness due to the accumulation of soil material washed down from the adjacent higher clay soils.

Subsoils: These soils have mottled dark-gray clay subsoils through which water and air move very slowly and plant root penetrations are shallow.

Position: These soils occur in the low swags scattered throughout the clayey and mixed soils.

Percent of county: Approximately 5 percent.

Group consists of: 212.

Use and Treatment

Surface drainage: Rows usually parallel these fairly narrow low swags. The clayey subsoils and depressed position of these soils always make artificial surface drainage necessary. However, the location of these soils in the natural low swags or depressions makes them invaluable as guides for locating secondary and primary drainage ditches and canals.

Subsoiling: Subsoiling of these soils has not given significant results.

Adapted crops: Forest and rice are probably the best adapted uses. With the very best of surface drainage, some of these shallow low swags may be used for fescue, white clover, Dallisgrass, lespedeza, and summer temporary grazing crops.

Rotations: These narrow areas are usually too small in size to separate from the other soils and put to a different land use. Therefore, they are usually put in the same rotation as the surrounding soils. If these areas are large enough to merit separation from rest of field, they should not be planted to non-legume row crops for more than 1 year out of every 6. Two or three years of rice and three years of pasture sods or soybeans is a rotation that shows some promise. See rotations for group 9.

Fertility: These soils have accumulated fertility from the adjacent soils and are usually slightly more fertile than the surrounding land. However, the excess water that accumulates in these low swags prevents them from being the most productive. The soil reaction ranges from slightly acid to strongly acid.

Land-Capability Classes of Humphreys County*

Several different colors appear on the land-capability maps. There may be as many as four colors. Each color tells you about the land: Whether it is suited for cultivation or not, and the general degree of difficulty or risk involved in its safe use without damage. Each color shows one of four classes of land that are called land-capability classes. The table on page 29 shows the safe used of the land of each class, and the color that represents the class. The classes are distinguished by Roman numerals as well as by the standard colors.

Classes I, II, and III include the land that is suited for regular cultivation, and Class IV the land that can be safely cultivated only occasionally, that is, in a limited way.

Here are descriptions of the four land-capability classes:

Class I is very good land from all points of view. It is nearly level and does not wash readily. The soil is deep and easy to work. It holds water well and is at least fairly well supplied with plant nutrients. Such land is scarce in many localities. It is not present at all on some farms. Anyone who is fortunate enough to have some Class I land can use it safely in almost any way that he chooses. Of course, it should be managed so that a good supply of plant nutrients and good physical condition are maintained.

The other classes are farmed with greater difficulty or greater risk than the Class I land.

Class II is good land from every standpoint, but certain physical conditions make it not quite so good as Class I land. The slope may be just steep enough to make water run off at a speed which will carry away soil.

Some Class II land is naturally wet and requires drainage. Some has not quite as good water-holding capacity as Class I land. Each of these deficiencies either limits the use of the land to some extend or requires some special attention year after year. Even a single farm can have two or more variations of Class II land.

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*The material on "Land-Capability Classes" has been adapted from USDA Soil Conservation Service Pamphlet No. 128, "The Measure of Our Land," by J. G. Steele.

Since Class II land has some moderate, natural use limitations, some special treatment is called for, such as easily applied conservation practices like contouring, protective cover crops, simple water management, and crop rotations.

Class III is moderately good land by reason of one or more natural features. It can be used regularly for crops but, because of these natural restrictions, intensive treatment of some kind is called for. Several variations occur in Class III, as they do in Class II. Some Class III land is moderately sloping and must have intensive care to control erosion if used for crops in a regular rotation. Another variation of Class III land calls for water management because of poor drainage.

When you see red on a land-capability map you know at once that stands for Class III land and also that the best of farming methods are required. A land-capability map tells at a glance how much and what variety of Class III land is on a farm, and just where it occurs.

Class IV land is good enough for occasional cultivation under careful management, but it is not suited for regular production of cultivated crops. It is too wet

Outline of the land-capability classification.

Major land use suitability (Broad grouping of limitations)	Land-capability class (Degree of limitations)		Land-capability subclass (Grouping of land-capability units according to kind of limitation.)	
Suited for cultivation	I	Few limitations. Wide latitude for each use. Very good land from every standpoint. (Green on map.)		
	II	Moderate limitations or risks of damage. Good land from all-around standpoint. (Yellow on map.)	IIe	Limited by hazard of water erosion; gently sloping land.
			IIs	Limited by special soil conditions.
	III	Severe limitations or risks of damage. Regular cultivation possible if limitations are observed. (Red on map.)	IIIe	Limited by hazard of water erosion.
			IIIw	Limited by excess water; drainage needed for cultivation.
			IIIs	Limited by special soil conditions.
	IV	Very severe limitations. Suited for occasional cultivation or for some kind of limited cultivation. (Blue on map.)	IVw	Limited by overflows.

for regular cultivation because of accumulation of local water, or because of backwater flooding. Generally speaking, it can be cultivated safely perhaps 1 year in 6.

Class IV land, then, is only fairly good for crops other than forest, rice, and grass. Part of this land is good grass and rice land, and all of it is excellent forest land.

Map Tells More Than Land-Capability Classes—Physical features of the land that make its use difficult or risky determine the land-capability class. These physical features are of several different kinds. Some land is subject to impoverishing erosion if it is not protected. Other land is naturally wet, so that drains must be installed or maintained if crops are to be grown. Some land is shallow, or has other special soil conditions. These three kinds of land limitations make up the three possible subclasses of land within each of the land-capability classes.

Within Class III land, for example, all three of these land-capability subclasses occur. All Class III land is rather severely limited in its use, although it is suited for regular cultivation. Often all three of these subclasses—wet land, sloping land, and land with special soil conditions—are found on a single farm. They are suited for different crops and should be managed in different ways. The land-capability map shows the subclasses. It also shows, by means of the mapping symbols, significant variations in the subclasses.

Soil Series and Soil Types of Humphreys County

Alligator Series

The Alligator series consists of very plastic, poorly drained clayey soils formed from fine-textured, light-colored, Mississippi River alluvium. They occur in the slackwater areas of the floodplain and are locally called gumbo or buckshot soils. They occupy level to sloping relief and are found in many localities in the county. These soils are medium to strongly acid in reaction. Each soil type has overflow phases.

Soil types within the Alligator series:

312 Alligator clay
314 Alligator silty clay loam.

Soil Profile: (312 Alligator clay) The surface layer of this soil is a dark grayish-brown clay, very plastic when wet, firm when moist, very hard when dry, and 2 to 4 inches thick. Just beneath the surface is a gray clay layer, prominently mottled with yellowish brown, very plastic when wet, very firm when moist, very hard to extremely hard when dry, and slowly permeable to water. Other than a difference in surface texture, Alligator clay and Alligator silty clay loam have like profiles.

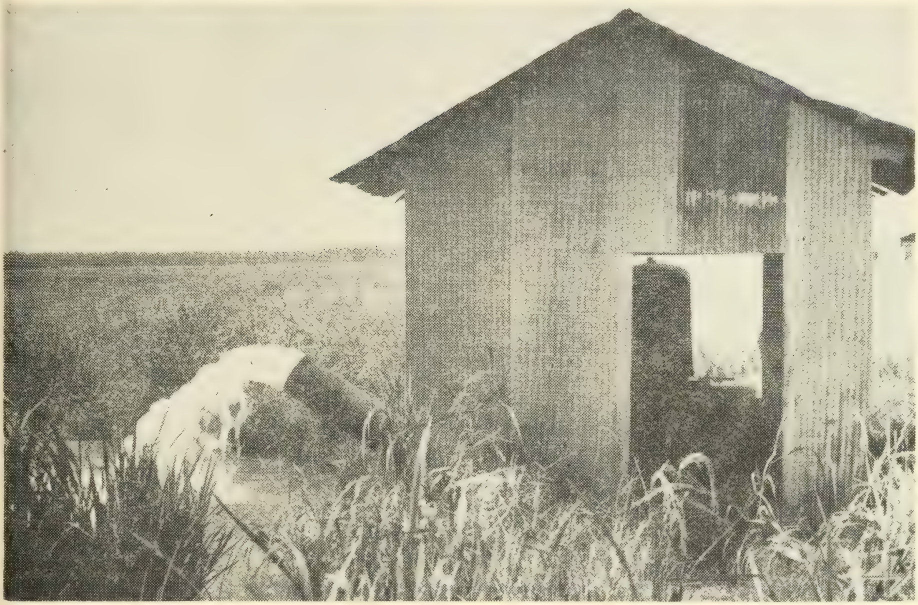
Bosket Series

The Bosket series consists of well drained soils that were formed mostly from medium- to coarse-textured Mississippi River alluvium. These soils, occupying nearly level and gently sloping relief, occur on the higher altitudes of the old natural levee formations. They have been free from overflows long enough to have some profile development and long enough to be partially leached. These infrequently found soils occur in small areas and have a very small total acreage in the county. They are medium acid in reaction.

Soil types within the Bosket series:

456 Bosket loam.

Soil Profile: The surface layer of this soil is a light brownish-gray, very friable loam, 7 to 9 inches thick. The subsoil is a dark-brown to brown, friable sandy clay loam, moderately rapidly permeable to



Rice has proven to be a good crop for the clayey Alligator soils. Irrigation wells, such as this one, are not only used for rice but also for row crops and pastures. (Courtesy of Miss. Extension Service.)

water, 16 to 18 inches thick. Below the subsoil is a layer of yellowish-brown, friable sandy loam.

Dowling Series

The Dowling series consists of poorly drained, very dark-gray soils formed partly from local alluvium washed down from the surrounding soils and partly from Mississippi River slackwater deposits. They occupy the low swags (depressions) of the area. These soils are frequently covered by water and are slightly to medium acid. Each soil type has an overflow phase.

Soil types within the Dowling series:

212 Dowling clay
220 Dowling soils (Surface textures

may be any of the following: clays, silty clays, silty clayloams, or silt loams.)

Soil Profile: (212 Dowling clay) The surface layer of this soil is a very plastic, very dark-gray to gray clay layer, mottled with various shades of brown, 36 to 40 inches think. This layer has a bluish-gray appearance at a glance.

Dubbs Series

The Dubbs series consists of moderately well to well-drained, productive soils formed from stratified beds of moderately fine- and medium-textured Mississippi River alluvium. These soils occupy nearly level and gently sloping relief on the higher altitudes of the old natural levee formations. They have been free from overflow long enough to have some profile development and long enough to be partially leached. They are medium acid in soil reaction.

Soil types within the Dubbs series:

445 Dubbs silt loam

446 Dubbs loam

Soil Profile: (446 Dubbs loam) The surface layer of this soil is a pale-brown, very friable loam, 6 to 8 inches thick.

The subsoil is a dark-brown to yellowish-brown silty clay to silty clay loam, moderately plastic when wet, firm when moist, hard when dry, moderately permeable to water, 12 to 14 inches thick. Below the subsoil there is a yellowish-brown, friable sandy loam layer. The profile has only a few faint mottlings or discolorations. Other than a difference in surface texture, Dubbs silt loam and Dubbs loam have like profiles.

Dundee Series

The Dundee series consists of somewhat poorly to moderately well-drained soils that were formed from stratified beds of medium and fine-textured Mississippi River alluvium. These soils, occupying nearly level to sloping relief, occur on some of the higher altitudes of the old natural levee formations. They have been free from overflow long enough to have some profile development and long enough to be partially leached. They range from medium to strongly acid in soil reaction. Dundee silt loam has both shallow and moderately shallow phases. Dundee loam has a moderately shallow phase.

Soil types within the Dundee series:

434 Dundee silty clay loam
435 Dundee silt loam
436 Dundee loam

Soil Profile: (435 Dundee silt loam) The surface of this soil is a light brownish-gray to grayish-brown, friable silt loam, 5 to 7 inches think. The subsoil is a grayish,brown to brown silty clay, faintly to distinctly mottled with shades of gray and brown; moderately plastic when wet, firm when moist, hard when dry; moderately slowly permeable to water; 16 to 18 inches thick. Beneath the subsoil is a grayish-brown layer of silty clay loam

The water-marks on these trees point out the annual backwater flooding problems in parts of this county. Some years large areas of land are covered by overflow water for several months. The growing of hardwood trees is the best land use. (Courtesy of S. C. S.)

to sandy clay loam material, faintly to distinctly mottled with shades of yellow, gray, and brown. Dundee silty clay loam has a slightly finer textured profile throughout than the Dundee silt loam. Dundee loam has a slightly sandier profile throughout than the Dundee silt loam.

Forestdale Series

The Forestdale series consists of poorly to somewhat poorly drained soils that were formed from stratified beds of medium- and fine-textured Mississippi River alluvium. These soils, occupying level to sloping relief, occur on the lower altitudes of the old natural levee formations. They are medium to very strongly acid in reaction. Forestdale silty clay loam has overflow phases and a shallow phase. Forestdale silt loam has overflow phases, a shallow phase, and a moderately shallow phase. Forestdale loam has an overflow phase and a moderately shallow phase.

Soil types within the Foresdale series:

423 Forestdale silty clay
424 Forestdale silty clay loam
425 Forestdale silt loam
426 Foresdale loam

Soil Profile: (425 Forestdale silt loam) The surface layer of this soil is a light brownish-gray, friable silt loam, 4 to 6 inches thick. The subsoil is a light brownish-gray to gray silty clay, distinctly mottled with shades of gray, yellow, and brown; plastic when wet, firm when moist, very hard when dry; slowly permeable to water; 18 to 22 inches think. Beneath the subsoil is a layer of gray silty clay loam material, distinctly mottled with shades of yellow, brown, and gray.

Other than a difference in surface texture, Forestdale soil types have similar profiles.

Iberia Series

The Iberia series consists of poorly drained soils formed from dark-colored, fine-textured Mississippi River alluvium. This series is found on nearly level relief in the wide flats of old cypress brakes. It is an infrequently found series and occupies less than one square mile in Humphreys County. It is neutral to slightly acid in reaction.

Soil types within the Iberia series:

d312 Iberia clay

Soil Profile: The surface layer is a black to very dark-gray clay, 2 to 4 inches thick. The subsoil is a black to very dark-gray, faintly mottled clay in the upper portion and in the lower portion it is a gray to dark-gray clay, mottled with various shades of brown. It is very plastic when wet, very firm when moist, very hard to extremely hard when dry, and slowly permeable to water. Decaying pieces of wood are found throughout the profile.

012f Alligator-Dowling Clays, Overflow Phases

In some of the large wooded overflow areas in the eastern part of the county, Alligator clays and Dowling clays are not separated. The overflow phases of Alligator clay occupying level and nearly level relief, occur in large areas interwoven by overflow phases of Dowling clay in the low swags. These soils are subject to annual overflows by backwater flooding of the Yazoo River and its tributaries.

025 Forestdale-Brittain Silt Loams

These poorly to somewhat poorly drained silt loams occur mixed in pattern on the old natural levee formations along Silver Creek and Straight Bayou and were mapped together as a complex. The Forestdale silt loams were formed from stratified beds of fine- and medium-textured alluvium; whereas, the Brittain silt loams were formed from highly silty alluvium. This silty parent material is reflected in the soil profiles of Brittain silt loams. They have silt loam or silty clay loam subsoils; whereas, the Forestdale silt loams have silty clay subsoils. Both soils are similar in other profile characteristics.

035 Dundee-Pearson Silt Loams

These somewhat poorly to moderately well drained silt loams occur mixed in pattern on the old natural levee formations along Silver Creek and Straight Bayou and were mapped together as a complex. The Dundee silt loams were formed from stratified beds of medium- and fine-textured alluvium; whereas, the Pearson silt loams were formed from highly silty alluvium. This silty parent material is reflected in the soil profiles of the Pearson silt loams. They have silt loam or silty clay loam subsoils; whereas, the Dundee silt loams have silty clay subsoils. Both soils are similar in other profile characteristics.

300f Alligator-Dowling-Forestdale Soils, Overflow Phases

In some of the large wooded overflow areas in the eastern part of the county, Alligator, Dowling, and Forestdale soils were not separated. The overflow phases of Alligator clay and silty clay loam and of Forestdale silty clay, silty clay loam, and loam are interwoven by overflow phases of Dowling soils in the low swags. Clay, silty clay, and silty clay loam surface textures predominate. These soils occur on level to gently sloping relief. They are subject to annual overflows by backwater flooding of the Yazoo River and its tributaries.

Soil Survey Methods and Definitions

By looking at the sides of pits, road cuts, or other holes dug on your farm, all of you have observed that your soils are lying in layers. You probably noticed these different layers because of their difference in color, texture, structure, organic matter content or some other distinguishing feature or trait. These series of layers forming the side of any dug pit on your farm are called collectively the **soil profile.** These soil layers or horizons are examined and studied by digging many test pits and by making many borings. Boundaries of similar soil profiles are sketched to scale in aerial photographs.

The following features are noted for each soil profile:

1. Texture—The percent of sand, silt, and clay.

2. Color—An indication of the internal drainage.

3. Structure—The natural arrangement of the soil particles into aggregates.

4. Consistence—Refers to such conditions as friability, plasticity, stickiness, hardness, compactness, toughness, and cementation.

5. Porosity—Refers to the degree to which the soil mass is permeated with pores or cavities.

6. Internal drainage—Refers to how easy excess water can pass through the soil.

7. Soil reaction—The sourness or sweetness of the soil.

8. Runoff—The rate of surface water runoff.

9. Content of organic matter and roots.

10. Relief or lay of the land (percent slope).

11. Erosion—The amount of surface layer that has been lost to erosion.

12. Parent material—Kind of soil material from which the soil was formed.

Upon the basis of these special features or traits, the soils are grouped into classification units. The three (3) principal units used in the field are: (1) soil series, (2) soil types, and (3) soil phase. In places two or more of these principal units may be in such mixed patterns that they cannot be clearly shown separately on the map and must be mapped as a complex.

A **soil series** is a group of soils similar in most every respect except the texture of surface layers. Therefore, one soil series may contain two or more surface textures. Alligator, Dowling, Forestdale, Dundee, and Dubbs are names of important series in this county.

Within a soil series are one or more soil types, defined according to the texture of the soil texture, such as clay, silty clay, silty clay loam, silt loam, and loam, is added to the series name to give the complete name of the soil type. For example, Alligator clay and Alligator silty clay loam are soil types of the Alligator series. Except for the surface textures of these two soil types, they have similar profiles.

One soil type may occur on several different slopes, may have different degrees of erosion, may have different depths, or may be subject to flooding by overflow water. These differences are shown by the use of **soil phases.** For examples, Alligator clay, level (0-½ percent slope) phase and Alligator clay, gently sloping (2-5 percent slope) phase are two separate phases of the same soil type, Alligator clay. One can readily see that these two phases will not have the same management problems. The level phase has problems of slow surface runoff; whereas, the gently sloping phase has possible problems of accelerated surface runoff.

The soil surveyors have made a map of this county showing the location of each of the soil types, phases, and complexes in relation to roads, houses, streams, lakes, and other local cultural and natural features of the landscape.

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Estimated average yields of principal crops under good management for the soils of Humphreys County.

Soil symbol	Soil group	Soil Name	Cotton lint (lbs. per acre)	Corn (hybrid bu. per acre)	Soybeans (bu. per acre)	Rice (bu. per acre) 1	Oats (bu. per acre)	Pasture (acres animal unit) 2	Page
012f	11	Alligator & Dowling clays, overflow phases (not separated)	3	—	—	—	—	—	26
025A	4	Forestdale-Brittain silt loams, nearly level phases	525	65	25	50	50-60	2.5	22
035A	1	Dundee-Pearson silt loams, nearly level phases	650	80	30	—	55-60	2.2	19
212	13	Dowling clay	—	—	15	70	—	—	28
212f	11	Dowling clay, overflow phase	—	—	—	—	—	—	26
220	10	Dowling soils	300	35	20	70	—	3.3	26
220f	11	Dowling soils, overflow phases	—	—	—	—	—	—	26
300f	11	Alligator, Dowling & Forestdale soils, overflow phases	—	—	—	—	—	—	26
312A°	12	Alligator clay, level phase	250	25	20	70	—	3.5	27
312A°f	11	Alligator clay, level overflow phase	—	—	—	—	—	—	26
312A	9	Alligator clay, nearly level phase	375	45	25	70	40-60	3.0	25
312Af	11	Alligator clay, nearly level overflow phase	—	—	—	—	—	—	26
312B	8	Alligator clay, gently sloping phase	375	45	25	70	40-60	3.0	24
312Bf	11	Alligator clay, gently sloping overflow phase	—	—	—	—	—	—	26
312C2	8	Alligator clay, sloping moderately eroded phase	—	—	—	—	—	3.5	24
d312A	9	Iberia clay, nearly level phase	400	50	30	70	40-60	3.0	25
314A°	12	Alligator silty clay loam, level phase	300	35	25	70	—	3.0	27
314A	5	Alligator silty clay loam, nearly level phase	425	55	25	70	45-60	2.8	22
314Af	11	Alligator silty clay loam, nearly level overflow phase	—	—	—	—	—	—	26
314B	8	Alligator silty clay loam, gently sloping phase	400	45	25	60	45-60	2.8	24
423A	9	Forestdale silty clay, nearly level phase	400	45	25	70	45-60	2.8	25
423B	8	Forestdale silty clay, gently sloping phase	400	45	25	70	45-60	2.8	24
424A°	12	Forestdale silty clay loam, level phase	300	35	25	70	—	3.0	27
424A	5	Forestdale silty clay loam, nearly level phase	450	55	25	70	45-60	2.7	22
424Af	11	Forestdale silty clay loam, nearly level overflow phase	—	—	—	—	—	—	26
424B	8	Forestdale silty clay loam, gently sloping phase	400	45	25	60	45-60	2.8	24
424Bf	11	Forestdale silty clay loam, gently sloping overflow phase	—	—	—	—	—	—	26

Estimated average yields of principal crops under good management for the soils of Humphreys County.—(Cont.)

Soil symbol	Soil group	Soil Name	Cotton lint (lbs. per acre)	Corn (hybrid bu. per acre)	Soybeans (bu. per acre)	Rice (bu. per acre)[1]	Oats (bu. per acre)	Pasture (acres animal unit)[2]	Page
424C2	8	Forestdale silty clay loam, sloping moderately eroded phase	------	----	----	----	--------	3.0	24
425A°	4	Forestdale silt loam, level phase	450	55	25	60	40-60	2.5	22
425A	4	Forestdale silt loam, nearly level phase	500	65	25	60	50-60	2.5	22
425Af	11	Forestdale silt loam, nearly level overflow phase	------	----	----	----	--------	----	26
425B	7	Forestdale silt loam, gently sloping phase	400	50	20	----	50-60	2.8	24
425Bf	11	Forestdale silt loam, gently sloping overflow phase	------	----	----	----	--------	----	26
425C2	7	Forestdale silt loam, sloping moderately eroded phase	------	----	----	----	--------	3.0	24
426A	4	Forestdale loam, nearly level phase	550	70	25	----	50-60	2.5	22
426Af	11	Forestdale loam, nearly level overflow phase	------	----	----	----	--------	----	26
426B	7	Forestdale loam, gently sloping phase	425	50	20	----	50-60	2.8	24
426C2	7	Forestdale loam, sloping moderately eroded phase	------	----	----	----	--------	3.0	24
434A	3	Dundee silty clay loam, nearly level phase	575	65	30	----	50-60	2.5	21
434B	6	Dundee silty clay loam, gently sloping phase	475	50	25	----	50-60	2.8	23
4343C2	6	Dundee silty clay loam, sloping moderately eroded phase	------	----	----	----	--------	3.0	23
435A	1	Dundee silt loam nearly level phase	650	80	30	----	55-60	2.3	19
435B	2	Dundee silt loam, gently sloping phase	500	60	25	----	50-60	2.5	20
436A	1	Dundee loam, nearly level phase	725	85	30	----	55-60	2.2	19
436B	2	Dundee loam, gently sloping phase	525	60	25	----	50-60	2.5	20
445A	1	Dubbs silt loam, nearly level phase	800	95	30	----	55-60	2.0	19
445B	2	Dubbs silt loam, gently sloping phase	550	70	25	----	50-60	2.5	20
446A	1	Dubbs loam, nearly level phase	800	95	30	----	55-60	2.0	19
446B	2	Dubbs loam, gently sloping phase	550	70	25	----	50-60	2.5	20
456A	1	Bosket loam, nearly level phase	700	80	20	----	50-60	2.3	19
456B	2	Bosket loam, gently sloping phase	525	65	20	----	50-60	2.6	20

[1] Rice yields decline sharply after the first two years of continuous rice.

[2] An animal unit is equivalent to one mature cow, steer or horse, five hogs, or seven sheep or goats.

[3] Not recommended.

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A COMPARISON BETWEEN THE DIETS OF FAMILIES LIVING ON UNPRODUCTIVE AND PRODUCTIVE FARMS

Including Analyses of Mineral Content of Six Commonly Used Home-Produced Vegetables and Of Soils in Which They Are Grown

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A COMPARISON BETWEEN THE DIETS OF FAMILIES LIVING ON UNPRODUCTIVE AND PRODUCTIVE FARMS*

Including Analyses of Mineral Content of Six Commonly Used Home-Produced Vegetables and of Soils in Which They Are Grown

By OLIVE SHEETS, MERLE WADE and MARVIN GIEGER

The belief has prevailed that the diets of farm people living on infertile soil are deficient when their diet consists largely of home-grown foods. These foods are thought to be lacking in essential nutrients because they have been produced on poor soil. This view is expressed in the frequently quoted statement "If the soil does not have it in it, the plants and animals that grow there do not, or the people that eat these plants and animals." Thus the assumption is that a direct relationship exists between the fertility of the soil and human nutrition.

In cooperative experiments in six Southern states on one variety of turnip greens for the purpose of studying the effect of fertilizer treatment on the calcium, phosphorus and iron content it was found that conditions associated with the place where the turnip greens were grown caused much more variation in the content of each mineral than did fertilizer treatments (1 and 2). Work with cowpeas gave similar results (3). The effect of nitrogen fertilization on Vitamin C content was also studied by the Southern Cooperative Group. Here too they found that nitrogen fertilization did not significantly affect the Vitamin C content of turnip greens (4). In a study of the effects of increased nitrogen levels on the composition of collards the application of nitrogen produced few changes in the composition of collards which could be considered of nutritional importance (5).

The question was raised as to whether or not certain relationships between diet and soil productivity did exist in the home situation—which might not show up in an artificial situation such as from field tests.

It is the purpose of this study to compare diets of families on productive and unproductive farms and to determine whether a relationship could be demonstrated in the mineral content of six commonly used home-produced vegetables and soils in which they are grown.

Scope and Methods

The families were drawn from two groups of farms in Tishomingo and Alcorn Counties, Mississippi, included in a study conducted by Dr. O. T. Osgood of the Agricultural Economics Department (6). According to Dr. Osgood's classification productive farms had one-third or less of their crop land on poorer soil; unproductive farms, two-thirds or more on such soils. Estimation of the potential productivity of the soil was based upon data accumulated from thorough soil surveys in which the type of soil, the adequacy of drainage and the degree of erosion were taken into account. The productive soils were silt or sandy loams with little or no slope, and consequently little, if any, erosion. In general the better soils were the good deep soils on level land, either bottom land or the best terrace upland. The poorer soils were the thinner drier soils on slopes and higher land.

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*Thanks are due to Dr. Dorothy Dickins for help in preparation of manuscript, to Dr. Otis Osgood for assistance in selection of families and for advice, to Dr. Walter Drapala for making statistical analyses of the relation of mineral content of soils and vegetables, to Mrs. Laverne Permenter and Mrs. Jeanette Bunch for making iron analyses of the 1950 and 1954 samples of vegetables, to Mr. L. E. Gholston of the Soil Testing Service of The Agricultural Extension Service for making some of the soil analyses, to Dr. Lois Almon for reading the entire manuscript and offering helpful suggestions and to Miss Mary Nell Massey for tabulations and calculations made in connection with analysis of data.

The study was begun in the spring of 1950 and continued through the summer of 1954. A record of the kinds, amounts and sources of foods consumed during one week in spring, early summer, late summer or early fall, and winter was obtained from cooperating families; also the following samples for analysis: (a) One or more samples of each of six different kinds of vegetables collected from every farm garden to be analyzed for phosphorus, iron, calcium and nitrogen. These vegetables were: turnip and mustard greens, cabbage, snap beans, lima beans and Southern peas.* (b) Composite samples of both top and subsoil from each garden.

The Families: Only white families with husband, wife and one or more children between the ages of 2 and 18 years living at home were asked to participate in this study.** In all, 39 families were included, 37 of whom lived in Tishomingo County and two in Alcorn County. Although this number was not large, all families meeting eligibility requirements in Dr. Osgood's Tishomingo groups were used. Nineteen lived on "productive" farms, 20 on "unproductive" farms. The majority of families were farm owners, but there were two renters and two sharecroppers living on the better soil farms and four renters living on poorer soil farms.

Families on productive soil had an average of 4.27 members; those on unproductive soil of 5.10 members. Net income was obtained from 18 of those on productive farms and from 14 on unproductive farms for the year in which records were kept. (Incomes for 2 years were, however, obtained from two families.) The average incomes of these two groups were: on productive farms $901, on unproductive farms $719. Those on productive farms had considerably higher net farm incomes than those on unproductive farms. But those on unproductive farms more often had earnings from off-farm work. These findings are in line with income data obtained in the two areas by Dr. Osgood (6).

Family members had been reared in the Tishomingo-Alcorn County area. Therefore backgrounds of the two groups were comparable. Menus served, methods of preparing foods used, and kinds of foods produced were similar among those families on productive and unproductive farms.

Food Records

The food consumed by farm families varies with the season, being dependent upon the home-produced food available. For this reason weekly food records were obtained during four periods of the year*, namely, spring, (March and April) before gardens were in production, early summer (June and July) when in normal season gardens are in full production; late summer and early fall (August and September) when there is a limited supply of fresh vegetables**; and winter (December and January) during the butchering season. This latter period may influence the diet for a month or more since families butcher at different times and share the surplus with neighbors. An attempt was made to obtain a typical food record from each family for each period but this did not prove to be possible, chiefly because of families moving off the farm, or ceasing to farm during the study. Full-time employment in a nearby town or elsewhere proved more profitable. In all instances, however, at least one dietary record was kept by the family. (See Table 1 for number of records families kept.)

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*Collards were originally included in the list of vegetables but few families grew collards during study due apparently to drought which destroyed young plants.

**There was one family who did not meet these criteria.

*A few records were kept during periods shortly preceding or following periods named.

**During the last three years of the study severe drought during most of the growing season greatly reduced the supply of vegetables.

A total of 22 food records was obtained from families both on productive and unproductive farms for spring; 10 from productive and 8 from unproductive for early summer; 9 from productive and 11 from unproductive for late summer; and 12 from both productive and unproductive for winter. This makes the total number of food records for each area 53. A few families furnished more than one record for one season, having for example, kept a record of food in April, 1952 and April, 1953.

As will be noted from Table 2, families on productive farms used during the report week larger quantities per person of most types of foods than families on unproductive farms. These differences in quantities cannot be attributed altogether to more home-produced food or to larger amounts of purchased foods, but to a

Table 1. Number of food records kept by homemakers from families on productive and unproductive farms.

No. food records kept	Productive farms No. families keeping	Unproductive farms No. families keeping
1	2	5
2	5	2
3	7	9
4	5	3
5	0	1
Total families	19	20

Table 2. Food used at home per person per family on productive and unproductive farms: Average quantities of 11 food groups used at home in a week from all sources by season.

	Spring		Early summer		Late summer, early fall		Winter	
Foods	Prod. farms	Unprod. farms	Prod. farms	Unprod. farms	Prod. farms	Unprod. farms	Prod. farms	Unprod. farms
Leafy green and yellow vegetables, lbs.	2.48	1.58	2.71	2.58	2.27	2.12	2.71	1.59
Citrus fruits, tomatoes, lbs.	.72	.46	.69	.49	.87	.87	.78	.92
Potatoes, sweet potatoes, lbs.	1.64	1.47	2.03	2.68	1.22	.71	2.00	2.09
Other veg. and fruits, lbs.	2.68	1.54	2.75	2.55	2.36	3.80	4.43	2.83
Milk and milk products, lbs.*	10.30	13.18	14.10	7.83	12.81	12.40	13.42	14.64
Meat. poultry, fish, lbs.	1.78	.97	1.48	1.05	1.74	.80	2.08	1.75
Eggs, No.	9.02	8.60	8.32	7.22	6.22	4.32	5.15	3.92
Dry beans, peas, nuts, lbs.	.62	.52	.08	.14	.13	.09	.57	.83
Flour, bread, cereals, lbs.*	5.05	4.22	3.68	3.69	4.53	3.99	4.32	4.38
Fats and oils, lbs.	1.85	1.62	1.68	1.38	1.88	1.71	1.79	1.17
Sugar, syrups, preserves. lbs.	2.16	1.83	2.29	2.35	1.70	1.91	1.72	2.00

*Group total expressed in pounds of fluid milk or pounds dry cereal,

Table 3. Average money value of home-produced foods and average cost for purchased foods used per person per family on productive and unproductive farms during one week, by season.

Kind of food and type of farm	Season			
	Spring	Early summer	Late summer early fall	Winter
	Dollars	Dollars	Dollars	Dollars
Money value home-produced foods*				
Families, productive farms	1.81	2.05	1.84	2.07
Families, unproductive farms	1.59	1.58	1.40	1.83
Cost of purchased foods				
Families, productive farms	1.81	1.48	1.90	1.73
Families, unproductive farms	1.37	1.41	1.24	1.41

*Foods produced on the farm or obtained from fields, woods, lakes, or streams. Also includes a few foods received as gifts. Several of these families received a little home-produced food from neighbors or near-by relatives.

combination of the two. (See Table 3). But there was a greater difference in money expenditures for purchased food per person between the productive and unproductive farm groups than in money value of home-produced food per person except in early summer when expenditures per person of purchased food in the two groups were about the same.

The cost of purchased food was entered on the family food record. If the cost of an item was not given, the editor supplied one, based on the average cost of similar foods found on other records taken in the same area.

Foods produced on the farm and used on the family table during the week of record keeping were assigned money values on the basis of average prices farmers could have received for these foods if they had sold them. Prices for foods commonly produced for sale were obtained from the Agricultural Economics Department. Prices to use for other foods were obtained in the study area during the period of field collection by interviews with families and from neighborhood stores.

Nutritive Value of Home Supply: Was there any difference in the nutritive value of dietaries of families on these two kinds of farms? This question can be answered in part from calculations made to find the approximate food energy values and quantities of protein, calcium, iron, vitamin A value, thiamine, riboflavin, niacin and ascorbic acid available to each family. Quantities of food consumed or available for consumption were multiplied by figures for the nutritive value of foods in terms of energy, protein, and seven other nutrients. The factors found in tables of food composition, Agriculture Handbook No. 8 were used (7). The values used are for foods "as purchased" and make allowances for the presence of bones, pits, shells and other forms of refuse.

In arriving at the figures shown in Table 4, which compare the nutrients in the foods of the two groups of families, the requirements were first compared in terms of units using the requirements of a 45 year old normally vigorous man, as given in the table of Recommended Daily Dietary Allowances (8) as the standard. Thus, in a family consisting of a man, woman, and 8 year old girl, the requirements for calories would be 1 (for the man) plus .8 for the woman, plus .7 for the child, or a total of 2.5 nutritional units. The actual number of calories furnished by the food of this family per average day during the week recorded would then be calculated as described in the foregoing paragraph and this number would be divided by the number of nutritional units represented in the family to obtain calories per nutritional unit. A separate calculation was made for each family for each of the nutrients represented in the table.

The average supply of nutrients in diets of both families on unproductive as well as productive farms more than met National Research Council allowances (Table 4). Two factors should be taken into account when studying the high average values: (1) possible inclusion in the dietary records of foods fed to animals or put in the garbage can; and (2) probable losses of minerals and vitamins during cooking or reheating of foods.

While an effort was made to obtain a record of all foods discarded from serving dishes and cooking utensils some quantities of so-called waste may have been omitted, especially portions of home-produced foods. Farm families, particularly those having liberal quantities of foods produced on the farm, feed left-overs to animals as a regular part of their food management. Getting accurate accounts of such discarded foods is difficult. Another factor which may have increased the margin between quantities of foods recorded and actually consumed is the large percentage of inedible waste often found in foods, especially vegetables. Potatoes, for example, after months of storage have often so far deteriorated in quality that the percentage of inedible material is higher than the average found in food composition tables.

Nutrient values were calculated on the basis of their average content in foods before cooking or reheating. Therefore, due to losses during preparation of foods for the table the actual amounts of certian nutrients consumed would be considerably less than the averages indicate. Especially is this the case with ascorbic acid. In the Southern Family Food Consumption Study (9) where such losses were calculated, values for ascorbic acid were reduced by 27 to 41 percent in the average diets of white and Negro families in different farming areas; losses of thiamine, riboflavin, and niacin seemed to be of less importance.* No estimates were made in this Southern study of probable losses in vitamin A or minerals.

Average values may conceal great variations in the supply of nutrients individual families have. Table 5 was prepared to show these variations. As will be noted few families on either kind of farm failed to meet National Research Council recommended allowances for energy and

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*Calculated values for thiamine were reduced by 16 to 24 percent, for riboflavin by 3 to 8 percent and for niacin by 4 to 12 percent in average diets of white and Negro families in different areas.

Table 4. Average quantity of food energy and eight nutrients, derived from all foods furnished by the diets of families on productive and unproductive farms.*

Nutrient and Unit	Recommended allowance **	Quantity per nutrition unit per day	
		Families on productive farms	Families on unproductive farms
Food energy—calories	2900	3596	3741
Protein—grams	65	100	95
Calcium—grams	.8	1.5	1.4
Iron—milligrams	12	20	19
Vitamin A value (International units)	5000	7850	6500
Thiamine—milligrams	1.5	2.1	2.5
Riboflavin—milligrams	1.6	2.7	2.6
Niacin—milligrams	15	28	27
Ascorbic acid—milligrams	75	97	88

*Nutrients per family were based on an average of all records furnished by that family.

**NRC recommended dietary allowances for the physically active man were considered equal to one nutrition unit.

Table 5. Dietary adequacy: Percent of families on productive and unproductive farms meeting the National Research Council's recommended allowances for calories and 8 nutrients.*

Nutrient	Percentage meeting NRC allowances	
	On productive farms	On unproductive farms
Calories	84	85
Protein	95	95
Calcium	95	100
Iron	100	100
Vitamin A value	84	80
Thiamine	95	80
Riboflavin	100	100
Niacin	95	100
Ascorbic acid	89	75

*See footnote Table 4.

the eight nutrients. Vitamin A value, thiamine and ascorbic acid recommendations were less often met by families on unproductive farms than on productive farms.

There were only two families in this study who had nutritive values of less than two-thirds National Research Council allowances. One showed them for both thiamine and vitamin A value; the other for vitamin A value. Both families resided on unproductive farms.

It would seem from Table 6 that most of the few dietary deficiencies that occurred in families of this study were in early or late summer and among families on unproductive farms. But average vitamin

Table 6. Average quantity of food energy and eight nutrients derived from all foods furnished by the diets of families on productive and unproductive farms in the four seasons.

Nutrient and unit	Recommended allowance*	Quantity per nutrition unit per day							
		Spring		Early summer		Late summer, early fall		Winter	
		Prod. farms	Unprod. farms	Prod. farms	Unprod. farms	Prod. farms	Unprod. farms	Prod. farms	Unprod. farms
Food energy—calories	2900	3563	3333	3267	2595	3467	2903	3363	3266
Protein—grams	65	99	83	88	64	86	73	90	99
Calcium—grams	.8	1.5	1.5	1.6	1.0	1.5	1.3	1.5	1.6
Iron—milligrams	12	21	18	16	14	16	15	18	17
Vitamin A value International units	5000	7785	5359	5325	3602	4782	4266	8167	6984
Thiamine—milligrams	1.5	2.4	1.9	2.2	1.6	2.2	1.8	2.2	2.2
Riboflavin—milligrams	1.6	2.7	2.5	2.7	1.8	2.6	2.2	2.2	2.8
Niacin milligrams	15	19	13	16	13	16	13	16	17
Ascorbic acid—milligrams	75	100	68	98	87	77	72	107	83
Number weekly records		22	22	10	8	9	11	12	12

*NRC recommended dietary allowances for the physically active man were considered equal to one nutrition unit.

A values were low for both groups in late summer or early fall. Low vitamin A values were related to the fact that turnip greens and sweet potatoes, excellent sources of carotene, are usually not available in gardens in this season.

One might briefly summarize the nutritive value of the food supply of these two groups as very good. Both groups depended largely on home production. Because so many "protective" foods were produced at home and available to the family they were consumed in large quantities and good diets apparently resulted. As has been shown, very few families had less than National Research Council allowances of food energy and the eight nutrients. Those who had less were residing for the most part on unproductive farms.

The findings of this study are in line with those of Mrs. Willamay T. Dean's study of the effect of fertilizing the land on food consumption and health (10). She found that fertilization and increased production did not bring about observable changes in food intake.

One of the purposes of this study as stated in the introduction was to compare diets of families on productive and unproductive farms in relation to mineral content of six commonly used home-produced vegetables. An important part of the study is therefore the actual analyses of vegetables produced on these two types of farms. It has been shown that the addition of calcium and phosphorus to the soil increases the calcium and phosphorus content of turnip greens, but the addition of nitrogen decreases the calcium and iron in this vegetable (1 and 2). It is known, however, that there is a definite positive relationship between soil and plant nitrogen. It therefore seemed worthwhile to make a study to determine whether a relationship could be established between the mineral composition of the plant and the productivity of the soil.

Analyses for vitamins were not attempted because of the impossibility of getting the plants or plant parts to the laboratory without the partial loss of some of these nutrients. The counties where these collections were made were from 120 to 140 miles distant from the laboratory, and the process of collecting the vegetables usually occupied two to three days. Another reason for not attempting analyses of vitamins was because at the time of planning the study, previous investigations indicated less relationship between vitamin content and soil or fertilizer treatment than between mineral content and soil or fertilizer treatment (1, 2, 4, 11, and 12).

The vegetables analyzed were turnips and mustard greens, cabbage, snap beans, lima beans, and Southern peas. Most of the families grew all of these kinds, and ate them in considerable quantities. Furthermore, these vegetables are the most important plant sources in Southern diets for the minerals studied. They may therefore be considered representative and might be expected to reveal the differences in calcium, iron, and phosphorus sometimes found deficient in the diets of Southern people (9). The nitrogen content of the vegetables could also contribute information relative to the amount of protein of plant origin such vegetables add to the diet.

Vegetable Samples

All the families studied had a garden located, with one exception, near the house. The homes of the better soil farms were usually built on the lower level land representative of such farms, whereas the homes of the poorer soil farms were almost invariably built on higher land. Most of the vegetables consumed by the family were produced in the garden but Southern or field peas were frequently planted in the field, although for convenience and for an early crop, a patch of peas was often to be found in the garden also. Occasionally other vegetables such as turnip greens, lima beans and even snap beans were grown in the field especially during dry weather, when moist bottom land was available.

Some form of fertilizer was used on all gardens. Both barnyard and commercial fertilizers were applied to the large majority of gardens, but three families stated they used only commercial fertilizer. It was customary to plow under barnyard manure during the first plowing in the late winter and to add commercial fertilizer at the time of planting.

Sampling, storage and analyses of vegetables: One or more samples of each of the six different kinds of vegetables were collected from every farm garden during the seasons when they were available. Composite samples representative of the whole patch where the vegetable was grown were taken. They were immediately placed in pliofilm bags, which were then closed at the open end, and kept in iced containers during transportation. The samples, as collected, were temporarily stored in un-iced containers in a refrigerated room until taken to the laboratory. If the weather was warm they were re-iced before transportation. Vegetables were harvested and trimmed in the manner customary for the housewife since the object was to analyze the samples as they would be prepared for cooking. For instance, edible leaves of mustard and turnip greens were broken off the plants after they had reached a marketable stage of maturity. The petioles were discarded, also the lower portion of the mid-rib of the large mature leaves. Damaged leaves and outer green leaves were trimmed from cabbage. In sampling for analysis each head of a sample (3 to 4 heads) was cut into four approximately equal wedges. Slices were taken from all wedges to make up a composite sample.

Peas and lima beans were harvested at the stages of maturity when they were eaten as fresh vegetables. It was customary to harvest them when they were at the stage to "shell out easily." At this stage the seeds were mature, or nearly so, and the pods were beginning to dry out. Snap beans were harvested from an early to a late stage of maturity. When the pods of the beans became "shucky" they were shelled and the seeds were cooked with the younger pods.

Before analysis all samples of vegetables were well washed in tap and then in distilled water. Leafy vegetables were dried in the room until visible surface moisture had disappeared. Peas and lima beans were shelled after washing and snap beans cut into small pieces. Each sample was thoroughly mixed. All vegetables were dried in a forced draft oven at 65-70 degrees, then ground in a ball mill with porcelain jars and flint pebbles. Beans and peas were first broken up into small pieces using a porcelain mortar and pestle before being ground in the mill.

Samples were taken for moisture determinations and dried to constant weight at 65 degrees centigrade. A. O. A. C. methods (13, 14, and 15) were used for the analyses of calcium, phosphorus and nitrogen and Sheets and Ward's (16) modification of the iron method of Saywell and Cunningham (17) for the analysis of iron.

Mineral Content of Vegetables: The average calcium, phosphorus, iron and nitrogen content and the range of samples of the six vegetables collected from the gardens on productive and unproductive farms are shown in Tables 7 and 8. It is to be noted that there was little difference in the mineral content of vegetables from these two types of farms. From a study of the range in mineral content of vegetables on these two types of farms one notes that some samples from unproductive farms had more calcium, phosphorus, iron and nitrogen than did those grown on productive farms. Three of the six vegetables sampled grown on unproductive farms had higher average phosphorus values than those from productive farms.

One can conclude from these data that there is little if any difference in mineral content of vegetables grown in gardens on productive and unproductive farms.

Table 7. Average mineral and nitrogen content and range of 145 samples of six vegetables collected from gardens located on productive farms (dry basis).

Vegetable	No. samples	Calcium%		Phosphorus%		Iron mg/100gm		Nitrogen%	
		Average	Range	Average	Range	Average	Range	Average	Range
Turnip greens	23	2.289	1.383-3.351	.675	.498-.928	18.947	10.944-31.928	5.325	3.614-6.464
Mustard greens	25	2.017	1.346-2.639	.636	.421-.987	18.657	10.532-30.625	5.034	4.016-6.145
Cabbage	26	.536	.296- .749	.451	.297-.643	4.789	2.900- 7.542	**2.976**	**1.838-4.102**
String beans	27	.432	.274- .676	.477	.359-.599	7.713	3.418-10.794	3.433	2.541-4.358
Lima beans	16	.120	.079- .151	.441	.371-.508	7.452	6.394- 8.673	3.979	3.432-4.551
Field peas	28	.094	.066- .150	.489	.365-.634	6.662	4.871-12.590	4.245	3.767-5.009

Table 8. Average mineral and nitrogen content and range of 161 samples of six vegetables collected from gardens located on unproductive farms (dry basis).

Vegetable	No. samples	Calcium%		Phosphorus%		Iron mg/100gm		Nitrogen%	
		Average	Range	Average	Range	Average	Range	Average	Range
Turnip greens	26	2.188	1.105-3.498	.652	.408-.936	17.380	8.945-28.679	5.213	3.438-6.687
Mustard greens	22	1.952	1.418-2.461	.621	.456-.846	18.343	10.405-32.880	4.608	3.226-5.808
Cabbage	25	.523	.298- .693	.456	.285-.649	4.640	3.674- 7.107	2.947	2.110-4.119
String beans	31	.398	.259- .500	.490	.383-.609	7.486	3.056-11.042	3.336	2.775-4.128
Lima beans	24	.118	.061- .162	.413	.323-.526	7.793	5.019-16.312	3.729	2.789-4.573
Field peas	33	.095	.054- .135	.491	.315-.627	6.328	4.788-10.210	4.232	3.480-4.779

Not only does the mineral content of vegetables vary on these two types of farms, but it varies on the same farm from time to time depending on weather conditions and fertilizer. For example, Mrs. X, who lived on an unproductive farm, gave two samples of turnip greens at different times. The mineral content of these two samples was as follows: percent of calcium, 2.644 and 1.749; percent of phosphorus, .537 and .408; milligrams of iron per 100 grams, 20.943 and 13.972; and percent nitrogen, 5.218 and 4.610. Mrs. Y, who lived on a productive farm, gave two samples of turnip greens at different times also. The mineral content of these two samples was as follows: percent of calcium, 2.561 and 1.448; percent of phosphorus, .498 and .542; milligrams of iron per 100 grams, 18.192 and 24.333; and percent nitrogen, 4.794 and 6.017.

Analysis—Topsoil and Subsoil

Most of the roots of the vegetables are in the topsoil but there may be some in the subsoil especially during dry weather. Therefore, samples of both topsoil and subsoil were obtained. The results of analysis of composite samples of these two kinds of soil from gardens on productive and unproductive farms are shown in Table 9.

The biggest relative difference between average values of topsoils in gardens on the two types of farms was in calcium and potassium. It will be noted, however, that calcium, phosphorus, potassium, nitrogen, organic matter and pH varied greatly in gardens on both types of farms. The striking thing about Table 9 is not the differences between garden soils on these two types of farms but the similarities. The kinds and amounts of fertilizer used may well have been the chief factor re-

Table 9. Analyses of soil taken from gardens on productive and unproductive farms.

Soil and type farm	No. farms sampled	Available Ca me/100g	Available P lbs./acre	Available K me/100g	% N	% Organic matter	pH
Productive farms							
Topsoil							
Average	15	5.74	42.32	.55	.075	1.487	6.71
Range		1.26- 17.06	8.16- 65.04	.15- 1.06	.050- .110	.760- 2.550	5.60- 7.60
Subsoil							
Average	15	3.99	7.91	.51	.049	.797	6.09
Range		1.37- 8.33	.23-* 28.65	.10- .84	.303- .060	.550- 1.330	4.95- 7.25
Unproductive farms							
Topsoil							
Average	17	3.53	33.99	.33	.067	1.489	6.07
Range		1.40- 8.34	1.40- 74.65	.16- .72	.033- .096	.641- 2.464	4.75- 7.50
Subsoil							
Average	17	2.81	4.25	.34	.049	.913	5.47
Range		.98- 5.58	.50-* 21.12	.22- .67	.030- .098	.404- 2.500	4.55- 6.50

*No report given on 1 sample.

sponsible for these results but it was not possible to obtain accurate records of fertilizer practices from these families.

Relation of Topsoil and Subsoil to Mineral Content of Vegetables: Correlation analyses were performed on nitrogen in each of the six vegetables and nitrogen in the topsoil, as well as on calcium in vegetables and calcium in topsoil, on iron in vegetables and pH in top soil, and on phosphorus in vegetables and phosphorus in topsoil. In no instance was the correlation greater than .27. Similar analyses were made on subsoil data and nutrients in these vegetables and no greater correlation was found.

It would therefore seem that productivity of land is not a particular concern of the nutritionist, because it is possible to obtain sufficient variety and quantity of food of high nutritive quality from land regardless of original characteristics by adding proper fertilizer. In fact, judging from the observations made in this study, it seems quite unlikely that any farm families would attempt to grow a garden without some form of fertilizer since, if produced on poor soil the quality and quantity of the vegetables would be such that the effort would not be worthwhile.

Summary and Conclusions

The purpose of this investigation was to compare diets of families on productive and unproductive farms relating family diets to the mineral content of six commonly used home produced vegetables and the soils in which grown. The families were drawn from two groups of farms included in a study conducted by an agricultural economist at the Mississippi Experiment Station. The productive farms had one-third or less of their crop land on poorer soils; the unproductive farms two-thirds or more on such soils.

Only white families with husband, wife and one or more children between the ages of 2 and 18 years living at home were included. The following data and samples were obtained during 1950-54 from 19 families on productive farms and 20 on unproductive farms: (1) A record of the kinds, amounts and sources of foods consumed during one week in spring, early summer, late summer, or early fall and winter; (2) One or more samples of each of six different kinds of vegetables during seasons when available; (3) Composite samples of topsoil and subsoil.

The average annual incomes of these two groups of families were: for those on productive farms, $901; for those on unproductive farms, $715.

Very few families on either type of farm had diets during report weeks furnishing less than the National Research Council's allowances of food energy and the eight nutrients. Those who had less than this standard were residing for the most part on unproductive farms. Families on productive farms used somewhat more home-produced as well as purchased foods per capita than did those on unproductive farms.

There was little difference in the mineral and nitrogen content of the six vegetables grown by families on these two groups of farms. Mineral and nitrogen content of vegetables varied to about the same extent on both types of farms, as well as on the same farm.

Correlation analyses on nitrogen in each of the six vegetables and nitrogen of the topsoil and of the subsoil as well as on calcium in the vegetables and calcium in the topsoil and in the subsoil, on iron in vegetables and pH in the topsoil and in the subsoil, and on phosphorus in vegetables and phosphorus in the topsoil and in the subsoil, failed to show any statistical significance.

It is thus concluded that differences in minerals in diets of families on productive and unproductive farms are the results of differences in income and in variety and yields of foods produced for home use rather than to a difference in nutritive value, weight for weight, of produce grown on these two types of farms.

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Industrialization And A Market For Food Products In The Kosciusko Trade Area

MISSISSIPPI STATE COLLEGE

AGRICULTURAL EXPERIMENT STATION

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Industrialization and A Market For Food Products In the Kosciusko Trade Area

By

Dorothy Dickins, L. D. Welch and W. E. Christian

INTRODUCTION

It is the purpose of this survey to show to what extent industrial expansion has helped local farmers by furnishing additional markets for food products; also, to point out possibilities for increased benefits to farmers from an industrial program.

Families as well as food handlers are important keys in explaining the market for local food. This survey, therefore, consists of two parts—that concerning the family and that concerning the food handler (wholesaler, retailer, processor). Information from each of these is necessary for understanding food marketing in an area and for making recommendations for a more effective marketing program.

Food handlers will find this report of interest, since it shows amounts, kinds, and prices of foods bought, reasons for not buying, preferences of various groups composing the population.

Kosciusko is a typical small city which has recently expanded its industrialization program. Prior to 1950 non-farm job opportunities in the Kosciusko trade area were limited. The principal source of industrial employment was a textile mill which employed six to seven hundred workers. A grain mill, a milk condensary, a cotton oil mill, five lumber mills and ten small plants of other types provided employment for a limited number of workers.

A bus body manufacturing plant, established in Kosciusko in 1950, provides the area's largest industrial payroll. Operations were begun in 1951, and by May, 1953—the time these surveys were started—455 persons were employed. At this time officials in the plant had announced intention of expanding its facilities.

Even though the number of persons employed in manufacturing in Attala County (of which Kosciusko is the county seat) declined after 1951, there was an increase of nearly 10 percent in all non-farm employment in 1953 over 1950. Furthermore, manufacturing wages increased by more than one million dollars from 1950 to 1953 (See Table 1 in the Appendix for yearly employment and total payrolls in non-farm industries in the county 1950-1953).

From a total labor force of 8829 in the county in 1950, 8501 were gainfully employed. Percentage distribution of employment among principal occupation groups was as follows: agriculture 50.8%, manufacturing 16.6%, trade services and others 32.6%. Thus, while more than one-half of the persons gainfully employed were in agriculture, one out of six was employed in manufacturing.

Agriculture practiced in the area is predominately of the general type. Cotton, dairying and small-scaled livestock enterprises, often carried on in combination, provide the principal cash farm income.

Though the average farm in the county is too small for efficient livestock enterprises, census data indicate that the number of such enterprises has steadily increased since 1939. In that year cattle and calves were sold from 1,148 farms. By 1949 the number of farms selling such animals was 1,503. The number of farms producing hogs for the market increased from 427 to 928 over the same time period.

Broiler production enterprises are becoming of increasing importance in the area. There were approximately 25 such enterprises in the county in 1953. The average size of brood produced was 5,000 birds, though a few producers raised broods of 10,000 to 20,000.

The increase in non-farm job opportunities accompanying Kosciusko's industrial expansion has attracted many persons away from the farm to manufacturing or related employment in town. Many families continuing to live on the farm, but when employed elsewhere, no longer produce many of their food items which formerly were produced at home. This, of course, is also true to a larger extent for those families who have moved from the farm to town. The extent of the shifts away from home production of food products will be discussed later in this bulletin. The existence of such shifts would presumably indicate that industrial development of an area, even in its early stage, should afford to those who remain on the farm greater marketing possibilities for food products than had existed prior to such development.

THE FAMILY SURVEY

Two hundred and fifty families in Attala County were interviewed during May, 1953. One hundred and twenty-five lived in Kosciusko, henceforward designated as the **Urban** area; and 125 lived within a 10 mile radius of the city, henceforward designated as the **Rural** area.

Dr. Earl E. Houseman, Statistical Assistant, Office of Marketing Services in the U. S. Department of Agriculture, drew the areas in which the rural interviewing was to be done in such a way that a representative sample of all families in the area were visited. Rural areas were sampled at the rate of about one in fourteen. The urban sample was drawn from a list of family dwellings having electric light meters. This sample was supplemented with one taken from a list of dwellings without light meters, compiled with the assistance of light-meter readers for the city.

One in every 13th dwelling in the urban area was visited. However, only families of two or more members who have at least one meal per day in the home together were interviewed. It is this type of family that is most important from the consumer-market viewpoint. Likewise, families in existence less than one year were not surveyed, since it was necessary to relate consumer-market data to annual family income.*

Supplementary data were obtained by questionnaire from 46 percent of the urban and 32 percent of the rural sample in December, 1953. Urban families returning the questionnaire had slightly higher incomes than families in the entire urban sample; but rural families returning the questionnaire had slightly lower incomes than did all rural families.

Description of the Families

Urban and rural families in these samples were very much alike in certain respects. About three-fourths of the families in each group were white families, about one-fourth Negro families. Both groups averaged a little less than 4 members (3.7 members for urban, 3.8 members for rural). But three times more rural families than urban families had family heads of 60 years of age and over (30 percent and 11 percent). It is well to keep in mind that the rural sample has more older families than does the urban sample.

Both husbands and wives in urban families had much more schooling than those in rural families. The percentage of families with husbands and wives who had completed high school or attended college was:

	Urban	**Rural**
Husbands	38%	15%
Wives	42%	21%

Likewise, more husbands and wives in rural families had not completed grammar school. The percentage of families having husbands and wives with this little schooling was:

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*There were 146 dwellings with 158 families in the Kosciusko sample and 166 dwellings with 147 families in the rural sample. In Kosciusko 7 of the 146 dwellings were vacant at the time of the interview; 25 families were ineligible (6 of these were ineligible due to visiting away from home and not having taken at least one meal per day at home during the week preceding the interview); 8 homemakers could not be contacted or were unable to cooperate. In the rural sample 23 of the 166 dwellings were vacant at the time of the interview; 14 families were ineligible; 8 homemakers could not be contacted or were unable to cooperate.

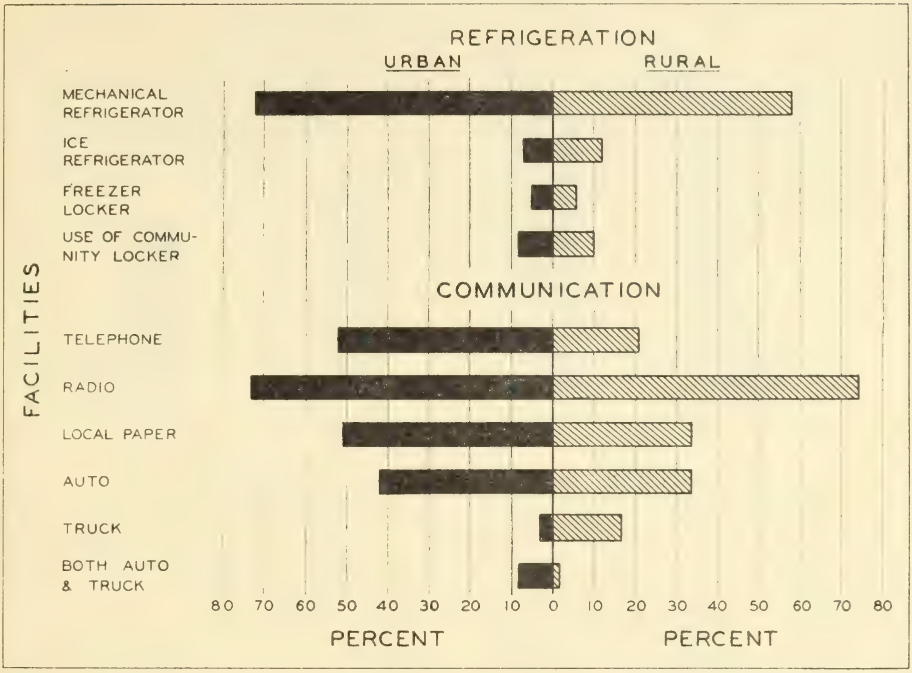

Figure 1. Percentage of urban and rural families with specified refrigeration and communication facilities.

	Urban	Rural
Husbands	19%	38%
Wives	19%	28%

There are two types of facilities which are closely related to shopping habits of the consumer-buyer. These facilities are communication and refrigeration. The percentage of families having specified facilities of these two types are shown in Figure 1.

Source and Distribution of Family Income

From what sources did urban and rural families obtain their incomes? What were family incomes the year preceding the interview (1952-53)? What members had had off-farm work experience? Answers to questions such as these give basic background information for understanding the local food marketing situation.

More families in both urban and rural samples received income from off-farm earnings than any other source, as is shown:

Families with:	Urban	Rural
Income from farm operation	8%	50%
Income from off-farm earnings	95%	68%
Income from other sources	33%	45%

Income from "other sources" includes income from pensions, welfare payments, interest, net from rental property and the like. Percentages in the above summary total more than 100 because some families received income from a combination of these sources.

Figure 2 shows the distribution of urban and rural families by net cash income.* As will be noted, the greater percentage of families, both in the urban and the rural samples, had incomes of $1000-$2999.

When the urban families are arranged by net money income from the lowest

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*In a few cases where income was not obtained, the family was placed in an income class on the basis of kind of work and other type of socio-economic data that could be secured.

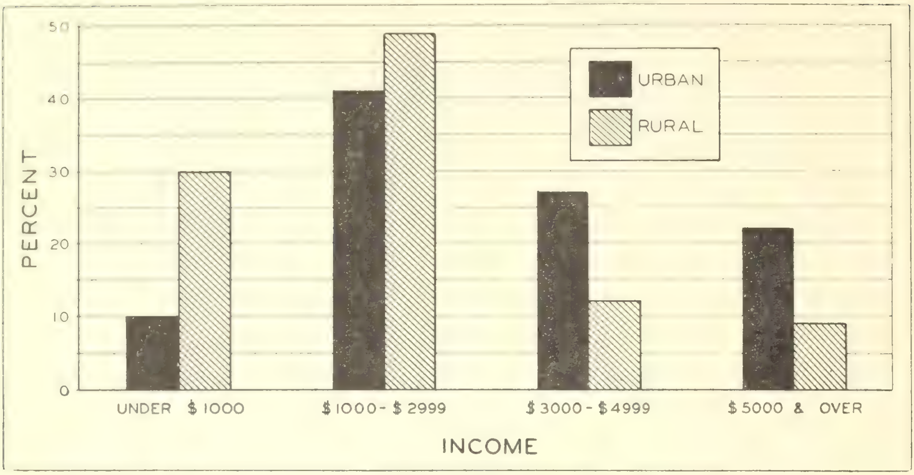

Figure 2. Distribution of urban and rural families by net income, 1952-53.

to the highest, the income of the middle or 63rd family was $2931. When the rural families are thus arranged, income of the middle or 63rd family was about one-half as great—$1440. But there was a difference in the middle income rural family who operated a farm and the middle income rural family who did not. The income of the middle farm operator family was $1169; that of the rural non-farm family $1768. It would seem that in spite of industrial development the farmer still lags behind in returns for his labor.

Income per capita (1952-53) was figured for Attala County using as a basis incomes of the 250 families included in the survey. Thus figured, average per capita income was $641. It is well to ask at this point how $641 agrees with other estimates. One such estimate was made for the years 1940-53 from data of the State Tax Commission. This estimate was about the same; $616 per capita (see Table 2 in the Appendix).

To understand the occupational situation of an area it is necessary not only to know the income, and the proportion of families deriving income from different sources, but also the main occupation of the family head, wife, and other employed family members.

As is known some persons have more than one occupation; that is they are farm operators and have work off the farm also. Listed below is the proportion of families in the survey with specified members having as their **main** occupation work other than farm operation. Also shown is the percentage of those engaged in non-farm work who had jobs in manufacturing.

	Urban		Rural	
	Non-farm	Non-farm mfg.	Non-farm	Non-farm mfg.
	%	%	%	%
Husband (or male head)	83	34	42	45
Wife (or female head)	29	21	10	30
One or more others in family	16	19	6	67

It is to be noted however that 93 percent of the husbands in the urban sample and 65 percent in the rural sample had done non-farm work of some kind at one time. Sixty-six percent of the wives in the urban sample and 39 percent in the rural sample had done work of this type since marriage. In other words many more had had non-farm work experience than were engaged in non-farm work in May 1953.

Consumer Shopping Habits

The middle income (or 63rd) family in the urban sample spent about $200 per capita per year for food: the middle income (or 63rd) family in the rural sample spent about $120. But families varied greatly in per capita expenses for food. Food expenditures were figured for the county using as a basis expenditures of the 250 families. Thus figured, average per capita expenditures were $145. This estimate is slightly higher than the estimated $132 per capita expenditures for food derived from taxable retail food sales (see Table 3, column 3, 1953). But some discrepency is to be expected because (1) the $145 estimated on the basis of the survey includes all food bought, that purchased from producers and creameries as well as retail outlets; (2) per capita figures used for rural families may be slightly larger than is actually the case, since it is based on expenditures of families within a 10-mile radius of Kosciusko. Rural families further away from town may purchase less food from retail outlets.

The 250 survey families spent on an average 23 percent of their income for food. As will be noted from Figure 3. about the same proportion of the retail dollar (using retail sales in Attala County compiled from Tax Commission reports) was spent for food.* Increases in the percentage of the consumer's dollar spent for food in 1954 over the five-year average (in both county and state) indicate an increasing dependency upon the market for the food supply.

Grocery stores used: Rural families traded at fewer grocery stores than did urban families. The percentage of families mentioning specified numbers of groceries at which they traded was:

	Urban	Rural
One grocery store	26%	46%
Two grocery stores	31%	34%
Three grocery stores	33%	15%
Four or more grocery stores	10%	5%

Ninety-nine percent of the grocery stores named by urban families were in Kosciusko, while 64 percent named by rural families were in Kosciusko.

Homemakers were questioned about years they had traded with these groceries, and store loyalty seemed about the same in both areas. About one-fourth of the stores named by homemakers were reported as having been traded with for one year or less. Only about one-third of the stores had been traded with more than five years.

Although rural families included in this survey lived within a 10-mile radius of Kosciusko, there were two families who lived as far as 14 miles, by way of the road to the city. Seventeen percent lived from 11-14 miles from Kosciusko.

Slightly more than one-fourth (26 percent) of the rural families did not mention a Kosciusko grocery store when asked to report grocery stores where they traded. Two of the 32 families not mentioning a Kosciusko store lived as close as 4½ miles from the city, but the majority not mentioning Kosciusko stores were 8 or more miles away. One-half of those families living more than 10 miles from Kosciusko did not mention a Kosciusko grocery. Those who did not mention Kosciusko groceries had relatively low incomes.

The wife (or female head) was the person who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. But men in relatively more rural than urban families shopped for food or assisted in this activity.

Buying from local producers: The amounts of specified food products purchased from local producers by urban and rural families during one year (1952-53) are shown in Table 1. These are estimates made from purchases by urban and rural families in the survey. Also the percentage of families buying each product this way is shown.

Eggs was the product which more families bought direct from producers (see Table 1). Much of such direct buy-

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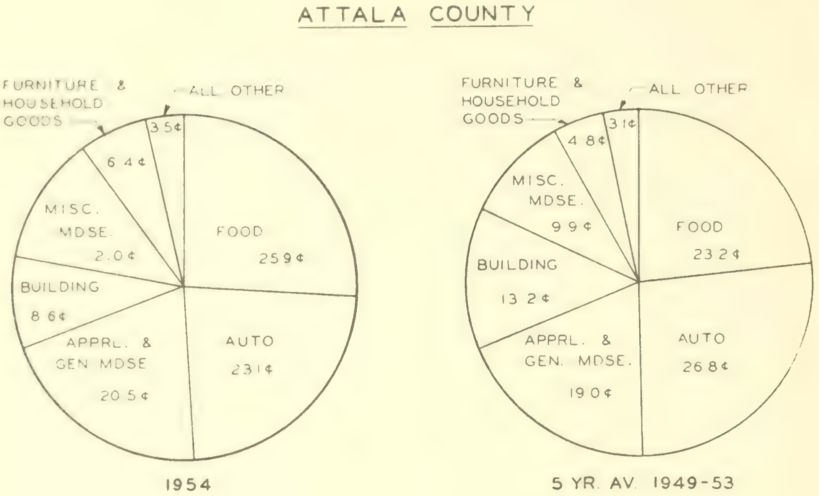
*Table 4 in Appendix gives dollar volume of taxable retail sales.



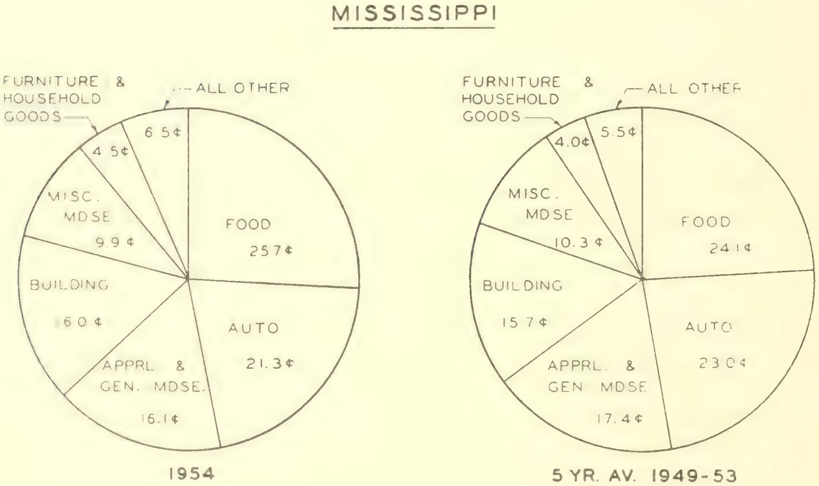


Figure 3. Division of the Retail Dollar by Classes of Consumers Goods, Attala County and Mississippi.

ing was from relatives and neighbors. In "beef and veal" and "pork" are included animals purchased at the livestock market for slaughtering and use in the locker.

Those buying direct from the producer bought in large quantities, but relatively few families bought this way. Nor was there a desire on the part of most consumers to buy from producers.

Table 1. Estimated total amounts of specified food products bought from local producers during 1952-53 by urban and rural families in Attala County, and percentage of urban and rural families buying this way.

Food Product	Urban families		Rural families	
	Quantity bought	% Buying	Quantity bought	% Buying
Whole milk	14,876 qts.	6	109,486 qts.	7
Eggs	73,691 doz.	50	56,618 doz.	19
Broilers	8,085 No.	14	1,995 No.	2
Tomatoes	11,642 lbs.	14	3,711 lbs.	2
Sweet potatoes	20,639 lbs.	5	37,346 lbs.	6
Leafy vegetables	11,686 lbs.	14	1,995 lbs.	2
Beef and veal	27,577 lbs.	15	99,431 lbs.	8
Pork	27,107 lbs.	15	21,227 lbs.	8

One of the important reasons given was the inconvenience. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled. For rural people inconvenience was a secondary reason, however. "Produce own, don't need" was the comment most often given when questioned about buying direct from producers. Urban homemakers, when questioned about practices of buying from producers, often made comments such as: "This kind of milk is not healthy"; "want chickens dressed and cut up"; "this kind of beef not healthy"; "producers sell in large pieces, we want small pieces"; "they don't give credit."

Other shopping habits: The amounts of purchased vegetables and eggs used during the week and the amounts bought at the last purchase were about the same. But for broilers, beef and pork, amounts at last purchase were considerably higher than amounts used. Some families bought meat and broilers in large quantities from farmers or the locker plant and so these last purchases raised the general average. Meat and poultry for freezing seems to offer potential market for farmers in the area. As has already been pointed out. 5 percent of the urban families had a freezer locker; 8 percent used the community locker. These proportions may increase with time, especially if good meat is available.

From sample data it would seem that milk is purchased 3 or 4 times a week. Rural families who used purchased milk used an average of 8.5 quarts and their last purchases averaged 2.9 quarts. Urban families who used purchased milk used an average of 10.4 quarts and their last purchases averaged 2.7 quarts.

The percentages of families whose last purchase* of certain foods was made at a retail grocery store in Kosciusko are shown below:

Purchased food	**Urban**	**Rural**
	%	%
Mustard greens	80	50
Turnip greens	75	67
Cabbage	92	76
Tomatoes	96	55
Whole milk	69	52
Buttermilk	71	57
Broilers	91	87
Ham	79	79
Sausage	88	67
Pork chops	92	83
Fat back	100	74
Bacon	93	72
Beef hamburger	91	89
Beef roast	86	73
Beef steak	90	80
Eggs	47	43

Vegetables not bought in Kosciusko were purchased from farmers or from groceries outside the county and in a few instances from rural groceries. Tomatoes were bought by a number of families, especially rural families, from Florida truckers. Much of the milk not purchased from Kosciusko groceries was purchased from a milk plant (or creamery). Eleven percent of the last purchases of whole and of buttermilk by rural families and 27 percent of whole and 21 percent of buttermilk by urban families were made this way.

When last purchases of specified foods were classified by whether for cash or credit it was found that a little more than one-third of these purchases were credit. Urban and rural families did not differ much in this respect, but slightly more rural families used credit.

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*Includes only families using during report week specified foods obtained by purchase.

When one thinks of local food products for sale, one must remember that many consumer-buyers like processed foods as well as (or oftentimes better than) fresh foods; in other words, they like a change. Fresh turnip greens, therefore compete with canned and frozen greens as well as with other green vegetables such as string beans, green limas and green peas. Whole milk competes with other milk products. Taking more of one type of product usually leads to taking less of another.

Table 2 shows spending patterns during one week for specified foods versus competing foods by Attala County families, based on purchases of urban and rural families in the survey, May, 1953. The seasonal nature of these data should, however, be taken into consideration. Figure 4 shows that manufacturing employment in the county is highly seasonal. Peaks occur in March and August and low points in April and May. Most of the consumption data were obtained for May when purchase might be slightly lower than average for year due to lower employment in manufacturing.

In getting a report of food expenditures during the past year homemakers were asked about food expenses during the past month; then about difference between past month and the remainder of the past year. Nine percent of the urban families and 20 percent of the rural families reported less spent in past month than monthly average for past year. (Four percent of urban families and one percent of the rural families reported more spent past month.) Rural families often mentioned fact that they had a lot of vegetables in the garden and didn't need to spend so much. A slack in employment was mentioned by a few.

Sources of the Family's Food

Many of the rural families in this survey carried on considerable home production, but only a few urban families did. Eleven of the 125 urban families were farm operators. Then too a few non-farm urban families kept poultry, hogs, and/or a milk cow. A number had gardens.

Forty-five percent of the rural and 10 percent of the urban families had used some home-produced milk during the year preceding the interview. About one-fifth of the urban families reported home-produced eggs and chickens used during this period; two-thirds of the rural families so reported. About one-half (49 percent) of the rural families had used home-produced pork and about one-eighth (13 percent) home-produced beef or veal. The percentages for urban families were 8 for pork and 3 for beef.*

Table 2. Estimated total amount paid for purchased specified foods and purchased competing foods used during one week, May, 1953, by urban and rural families of Attala County.

Kind of food	Urban families	Rural families	Total
Whole milk	$3,135	$3,334	$6,469
Buttermilk	304	1,376	1,680
Other dairy foods, such as dry and canned milk, cream, cheese, ice cream (does not include butter)	2,053	3,199	5,252
Fresh tomatoes	645	889	1,534
All other types of tomatoes, such as canned tomatoes, canned tomato juice, tomato paste, tomato soup, tomato catsup and tomato puree	453	796	1,249
Green leafy vegetables	199	235	434
Green leafy vegetables processed	42	34	76
All other green and yellow vegetables, fresh and processed	1,167	1,999	3,166
Sweet potatoes, cured	68	0	68
Sweet potatoes, canned	24	83	107
Irish potatoes, cured	533	1,197	1,730
Eggs	1,448	1,492	2,940
Broilers	1,836	1,801	3,637
Pork, fresh, cured or salted	3,809	5,107	8,916
Beef, veal—fresh	1,990	4,336	6,326
All other meats including fish and other poultry, lunch meats, wieners, canned meats or pork, beef	1,252	2,511	3,763

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*"Home-produced" refers to products raised by the family on land on which the family home may or may not be located. Several farms of Kosciusko families were on the edge of the city, many outside the city limits.

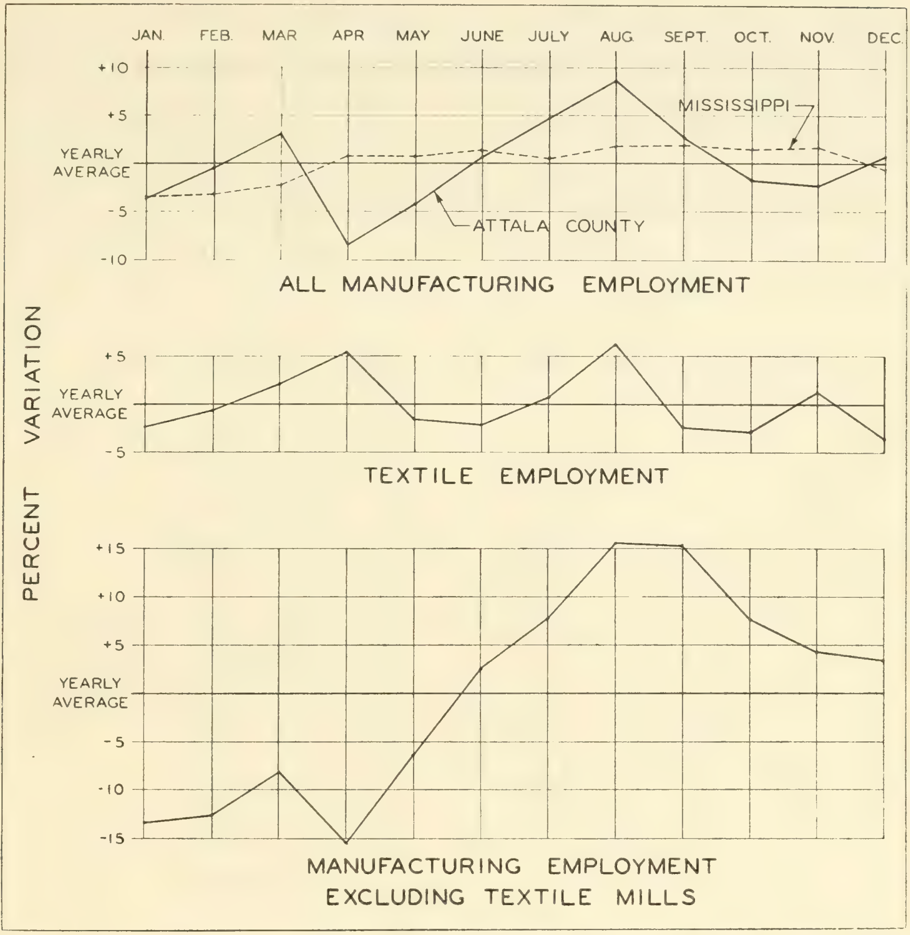

Figure 4. Average monthly variations in manufacturing employment, Attala County, 1950-53.

About 80 percent of the rural families and 45 percent of the urban families had used home-produced vegetables during the year preceding the interview. Turnip greens was the leafy vegetable most often grown for home use. Other important leafy vegetables were mustard, cabbage, and leaf lettuce.

Most families who had a garden grew tomatoes. Sweet potatoes were considerably less important. Only one-third of the rural families and one-fourteenth of the urban families reported having used home-produced sweet potatoes during the report year.

Average amounts of home-produced foods used by families producing were in all cases larger for rural families than urban families. Rural families carried on more food processing than did urban families.

From a study of the home-produced food supplies of the urban and rural families included in this survey, it seems that most urban and about one-half the rural families depend largely on purchase for their food supply. Many families produced some products but only in small quantities. Many of these low producers have the philosophy of "live at home" and think little about use of certain foods unless home-produced. When asked why they did not use some turnip greens, some eggs, some milk during the past week they replied, "Turnip greens in garden burnt up'; "hens not laying"; "cows dry."

In 40 (32 percent) of the urban families and 30 (24 percent) of the rural families surveyed, the family head had shifted from farm to non-farm work. An analysis of changes in home-production of these families should serve as a basis for prediction of what will happen as industrialization proceeds. Table 3 shows changes in production for home use by urban and rural families accompanying these shifts in occupation. The urban families who had shifted from farm to non-farm work, produced more food for family consumption than did other urban families in the sample. It may be that some of these farmers who had moved to town will later move back to the country where they will again carry on home production. Certain data suggests that this may be the case.

On the other hand, those in rural areas who had shifted from farm to non-farm work produced less food than farm families. It is interesting to note, however, that more of these rural families who had made the shift from farm to non-farm used home-produced beef. It also should be noted that from 1940 to 1950 the volume of food sold in retail stores increased by 60% while the total population of the county decreased by 11.8%. During the same time the population of Kosciusko increased by 57.4%. When these changes are considered together, the effect is to emphasize the shift from home-produced food to over-the-counter purchase of food as non-farm employment increases relative to farm employment.

Figure 5 shows the percentage of families using specified foods during the report week in May and the percentage who reported home production as the source of these foods. Percentages using specified home-raised foods the past week are lower than percentages having used some of these during the previous year, since many families have these foods only at the peak production season. The meat and broiler percentages are, for example, considerably lower than the percentage of families having used some the previous year, due to the fact that animals killed in the Fall had in many cases been eaten. Broilers were not "ready" on many farms; tomatoes had not ripened.

In rural areas such as this the home-produced food is not the biggest competitor of that food in the market. A large potential market lies in rural non-users (See Figure 5). This non-use is brought about by such things as habit and other offerings in the market (See Table 2).

Consumption Patterns

Table 4 shows total amounts of specified purchased foods used during one week by urban and rural families in Attala County, based on purchases of urban and rural families in the survey, May, 1953.

As has been previously explained, consumption data were also obtained from some of these same families by

Table 3. Changes in production for home use accompanying shifts from farm to non-farm employment by family heads (in 32 percent of the urban and 24 percent of the rural families surveyed).

Food item	Urban families				Rural families			
	Ceased home prod.	Still produce	Never produced	Total	Ceased home prod.	Still produce	Never produced	Total
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Beef	18	5	77	100	10	17	73	100
Pork	65	28	7	100	57	33	10	100
Broilers	60	35	5	100	40	53	7	100
Eggs	60	35	5	100	33	64	3	100
Milk	78	12	10	100	53	37	10	100
Tomatoes	40	53	7	100	33	67	0	100
Turnip greens	38	55	7	100	27	70	3	100
Sweet potatoes	77	7	23	100	50	23	27	100
Cabbage	45	52	3	100	30	57	13	100

questionnaire for one week in December, 1953.

There was a significant difference in proportion of families using purchased sweet potatoes, turnip greens, cabbage, and tomatoes during the winter and spring. The percentage of both urban and rural families using the first three was greater in winter but the percentage using tomatoes was greater in the spring. Average amounts used by families using in the two seasons were not very different except for sweet potatoes which were used in larger amounts in winter.

There was a significant difference in percentage of urban families using purchased beef steak, beef hamburger and sausage in the two seasons. (Differences in percentage of rural families using these purchased products in the two seasons was not significant). More urban families used steak, beef hamburger, and sausage during the Decem-

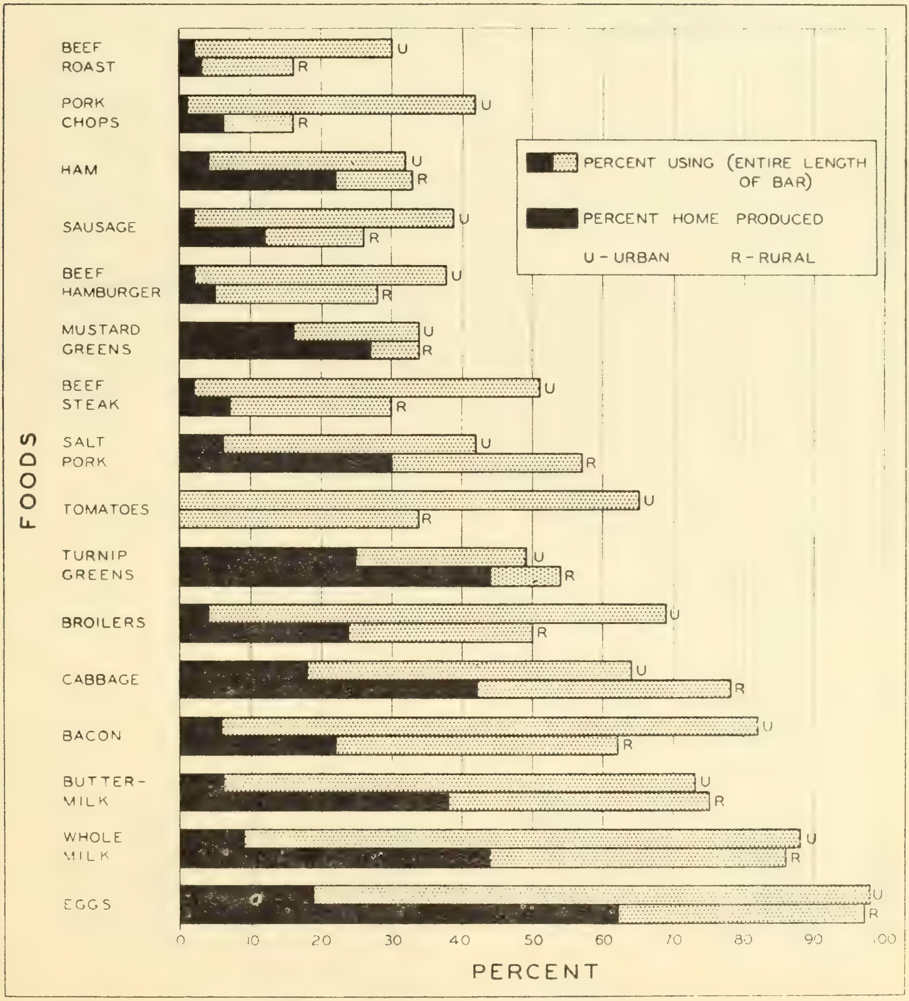

Figure 5. Percentage of rural and urban families using and producing at home specified foods during report week, May, 1953.

Table 4. Estimated total amount of specified purchased foods used during one week by urban and rural families, Attala County, May, 1953.

Food	Urban families	Rural families	Total
Whole milk	13,708 qts.	15,521 qts.	29,229 qts.
Buttermilk	3,873 qts.	6,264 qts.	10,137 qts
Eggs	3,207 doz.	3,192 doz.	6,399 doz
Broilers	3,153 lbs.	3,152 lbs.	6,305 lbs
Pork (no lard)	7,231 lbs.	9,566 lbs.	16,797 lbs.
Beef, veal	5,710 lbs.	7,172 lbs.	12,882 lbs.
Fresh tomatoes	2,466 lbs.	4,289 lbs.	6,755 lbs.
Sweet potatoes	441 lbs.	0	441 lbs.
Collards	44 lbs.	0	44 lbs.
Turnip greens	390 lbs.	279 lbs.	669 lbs.
Cabbage	2,029 lbs.	3,331 lbs.	5,360 lbs.

ber than during the May week. The average amount of purchased sausage used by urban families using was greater in December but amounts of the other two meats were about the same both weeks.

Relatively more rural families used purchased buttermilk in the winter than the spring season, but average amounts per family using this type milk were considerably greater in the spring. There may be other seasonal differences not shown because of limited number of winter records.

Food consumption - income level: Tables 5, 6, and 7 in the Appendix show proportion of families using specified foods from all sources and from purchased as well as the average amounts used from all sources and from purchase by families who used them. The changes in proportions using from lower to higher income are much greater in case of percentage buying than in percentage using. Some low income families produce these foods for home use; a few such families have these foods given to them by relatives.

Larger proportions of families in higher income groups purchased animal products (milk, eggs, meat) and tomatoes than of families in lower income groups. The local supply of tomatoes had not ripened at the time of the study. (See Table 5 in Appendix.) The percentages of urban families purchasing buttermilk, salt pork and cabbage tended to decrease as income became greater. Similar decreases were found in purchases of salt pork and cabbage by rural families.

Average amounts of these foods used did not vary greatly in different income groups except for eggs and whole milk. These two foods were used in larger average amounts by higher income families (Table 6 and 7 in the Appendix).

Since non-users of these foods are important to the marketer it would be well to summarize briefly the most prevalent comments of urban and rural homemakers regarding non-use of these foods during the report week. Such a summary is included in Table 8 in the Appendix. As will be noted the principal reasons given by homemakers for non-use during the week were: (1) financial—homemaker thought food was too expensive, she couldn't afford it or she had no money; (2) use of similar or other types of foods instead; (3) dependence on home supply—not accustomed to purchase; (4) family doesn't care for the food. (5) food not in season or considered an inappropriate food for this time of year.

Information concerning the use made of whole milk, buttermilk, tomatoes and eggs by the family was determined from each interviewee. The use made of a food product determines to a large extent the type of product which the consumer-buyer will want. About three-fourths of the whole milk used by urban and rural families was used as a beverage or in infant feeding. Milk for drinking needs to be especially good tasting, fresh and cold, if it is to satisfy the consumer-buyer and maintain her continued use in large quantities.

All tomatoes purchased during the report week, May, 1953, were used freshly sliced, or in salads or sandwiches. None were used in cooking. This means a demand for a firm, ripe tomato.

To be noted is the fact that about two-thirds of the eggs used by both urban and rural families were used in egg dishes, such as fried eggs, scrambled eggs, poached eggs and the like. An egg dish calls for an egg of higher quality than if used in bread, cake, or scalloped dish. Off flavors may not be detected if in cornbread or a chocolate cake, but this is not the case with fried or scrambled eggs.

Use of milk products: Records of milk products consumed at home by members of the 250 families were obtained. Milk used by each family includes not only the fluid milk but the fluid milk equivalent of evaporated, condensed, and dry milk, cream, ice cream and cheese. Conversion factors developed by the Human Nutrition Branch of the U. S. Department of Agriculture to express the nutritive value of each product as compared with fluid whole milk were used in converting milk products into equivalent quarts of fluid whole milk (the factors apply only in equating the various milk products to fluid whole milk on the basis of protein and mineral content). Quantities of milk or its equivalent recommended for different family members in the revised low-cost food plan developed by U. S. Department of Agriculture home economists were used in estimating milk needs for the family.

About two-thirds of the urban families and three-fourths of the rural families had 91 percent or more than the recommended amounts of milk products for families of their size and composition. It is to be noted (Figure 6) that one in fourteen families, rural as well as urban, had one-half or less than the suggested amounts of this important kind of food.

THE MARKET SURVEY

In 1953 there were about 80 retail food stores in Attala County (33 of which were in Kosciusko). Most of the 80 retail groceries in Attala County were relatively small. Only a few were of the super-market type.

No wholesale produce outlets were available to farmers in the area. The supply of food processing facilities available to producers was limited. Plants affording such facilities in Kosciusko in 1953 were: (1) a milk condensary, (2) a creamery and fluid milk bottling plant; (3) a grain mill (not concerned with food products of this

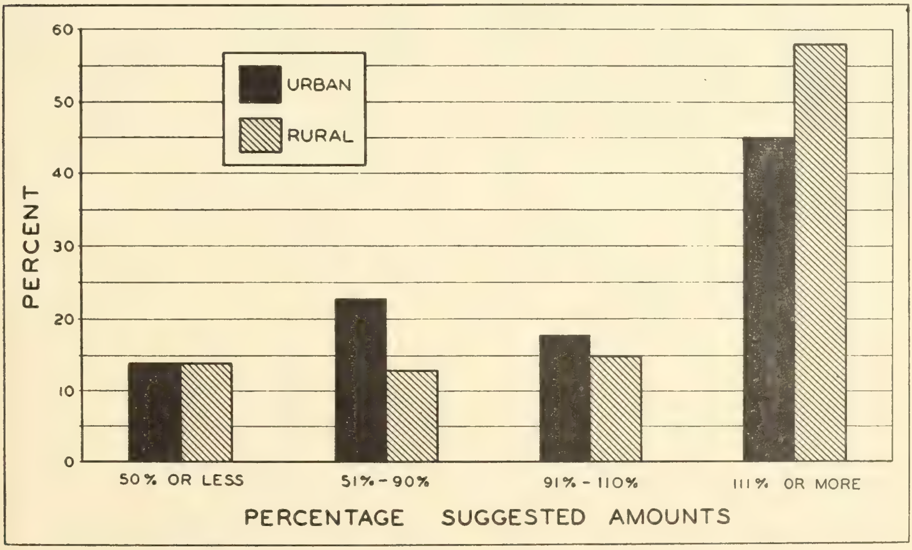

Figure 6. Percent of the 125 urban and 125 rural families using amounts of milk products during report week, May, 1953, suggested in low cost food plans.

study); and (4) a frozen food locker plant, which operated an abattoir, primarily as a service to locker renters and home freezer users, but at which some slaughtering was done for local markets.

It is interesting to note that relatively more of those included in the family survey sold milk or cream and eggs than other specified foods (see Table 9 in Appendix). Processing facilities were good in Attala County for milk. As has already been pointed out, eggs were sold direct to many families. They were also sold to many of the retail food stores. Several of the stores bought all eggs offered by producers. Three firms either operated or supplied rolling stores which picked up eggs at farms in the area, reselling them to the parent store. Surplus eggs, in excess of retail trade needs, were either resold at wholesale to other retailers in the area, or shipped to points in other areas.

Quantities and Sources of Selected Food Items Moving Through Food Stores

The survey of food stores was confined to the urban area of Kosciusko. The State Tax Commission statistics indicated that from 88 to 90 percent of all retail sales in the county since 1948 had been by Kosciusko firms.

Records of purchases of the selected products were obtained from 28 of the 33 retail food stores in May, 1953. Where possible, these records were transcribed directly from invoices. Six of the 28 stores did not make invoices available, but gave estimates of quantities purchased during the month. In September, 1953 twenty-one stores made invoices available and five gave estimates. January, 1954 purchase data were obtained from a total of 17 stores, including 5 for which managers estimated purchases.

Total quantities of selected products purchased by sources during each of the three survey months are shown in Table 5.

Beef: Essentially all beef purchased during the survey months was supplied by outside sources. Only 421 pounds was reported as purchased locally. This is attributable to the lack of meat processing facilities within the area. Meat market operators stated that were such facilities available, much of the demand for commercial and good grade beef could be supplied by local livestock producers. While emphasizing the quality of locally-grown meat animals, they stated that their customers did not want farm-slaughter beef.

Pork: The remarks made relative to beef purchases apply equally well to pork. Quantities shown in Table 5 are for all pork items excluding lard. January purchases of locally-produced pork are estimates derived from reports of live hogs bought locally for slaughter.

Broilers: All broilers sold through Kosciusko food stores were supplied by processors located in other points in the state. While there is some broiler production in the county, it is doubtful if production is of sufficient volume to justify commercial processing within the area, except on a very limited scale.

Eggs: Findings of the study indicate that a surplus of eggs is produced in the area in all seasons of the year. Nearly 21,000 dozen eggs produced on local farms were bought by Kosciusko retailers in May. More than one-half (10,830 dozen) of those bought were resold at wholesale. While some of these went to other retailers within the area, the greater portion of them were shipped to buyers in other points. Quantities shipped out during September and January were not ascertained, but dealers stated that out-shipments occurred during these months.

All egg purchases from local producers were made on current receipt basis. Three dealers reported the practice of paying premiums for unfertile eggs. Merchants stated that the number of commercial egg producers in the area was small. The greater part of local eggs offered was from small farm flocks, with only surpluses above farm needs being marketed.

Loss rates from deterioration were higher for locally-produced eggs than for shipped-in eggs, according to statements of retailers who handled eggs

Table 5. Quantities of selected foods moving through retail food stores in Kosciusko, Mississippi, three months, by source of purchase.

Product	Units	May, 1953		September, 1953		January, 1954	
		Shipped-in	Local	Shipped-in	Local	Shipped-in	Local
Beef	lbs.	18,533	——	31,501	——	25,314	421
	%	(100)	——	(100)	——	(98.4)	(1.6)
Pork	lbs.	28,450	——	32,940	——	25,303	2,050
	%	(100)	——	(100)	——	(92.5)	(7.5)
Broilers	lbs.	8,747	——	9,143	——	8,535	——
	%	(100)	——	(100)	——	(100)	——
Eggs	doz.	180	20,927	580	12,498	1,980	6,430
	%	(0.9)	(99.1)	(4.4)	(95.6)	(23.5)	(76.5)
Milk	qt.	7,606	13,637	8,978	12,120	7,480	10,342
	%	(35.8)	(64.2)	(42.6)	(57.4)	(42)	(58)
Tomatoes	lbs.	8,522	——	7,060	1,650	3,320	——
	%	(100)	——	(81.1)	(18.9)	(100)	——
Cabbage	lbs.	5,124	661	6,368	——	10,316	——
	%	(88.6)	(11.4)	(100)	——	(100)	——
Turnip greens	doz.	25	212	——	300	277	——
	%	(10.6)	(89.4)	——	100)	(100)	——
Collards	doz.	——	6	——	——	9	——
	%	——	(100)	——	——	(100)	——
Sweet potatoes	bu.	29.5	12.5	183	81	29	142
	%	(70)	(30)	(69.3)	(30.7)	(17)	(83)

from both sources. This they attributed to improper handling and marketing practices on the part of local producers.

Milk: Data indicate that about 40 percent of the fluid milk sold through retail stores was supplied by distributors from other sections of the state. Apparently, this is not due to a shortage in local supply, since the local distributor had, within the survey period, extended his operations to several other towns.

Tomatoes: Less than 20 percent of the tomatoes sold through retail groceries were supplied by local producers in September, the only survey month in which this crop was in season locally.

Merchants stated that consumers prefer locally-produced tomatoes, when available, to those shipped in. A higher average price paid for the local product may be an indication of this preference.

Retailers emphasized the point that locally-produced tomatoes deteriorate more rapidly in the stores than do those shipped in. Spoilage losses thus run higher on the local product. Suggested reasons for the difference in loss rate centered around inferior cultural practices, degree of ripeness when picked, and improper handling before marketing.

Leafy vegetables: Essentially all fresh greens sold in May and September were supplied by local growers. Only one store reported purchases from outside sources during those months. None were available from local sources in January, the supply that month being furnished by a trucker from South Mississippi.

Lack of dependable sources of supply in season affords a problem for most merchants. Here again this problem stems from small-scaled operations and irregularity of market delivery by local producers.

Sweet potatoes: This product is grown commercially within the trade area, yet findings of this study indicate that less than one-half of the sweet potatoes marketed through Kosciusko stores are locally produced. Seventy percent of those sold in May, 69 percent in September, and 17 percent in

January come either from wholesale produce firms or growers outside the area.

Preference for sweet potatoes from other than local sources was attributed to inferior marketing practices followed by local producers. The specific cause most often cited was lack of grading and washing, resulting in dirty potatoes of no uniformity in size being offered for sale.

Problems of Food Retailers in Buying Local Produce

Merchants were asked for expressions on problems they faced in buying from local farmers. Comments given below are typical and appear to point out three problem areas:

1. **Handling costs.** "No appreciable difference in merchandising costs for local and shipped in produce except for eggs and tomatoes." "Losses run higher on local eggs since we must guarantee freshness." "Customers prefer local tomatoes in season, but losses are greater because they are picked too ripe." "Can't inspect local produce as carefully as that from jobbers, since too many rejections offend producers, who are also customers."

2. **Quality.** "There is a need for an organized educational program to show producers what consumers demand in produce." "Producers tend to disregard what trade wants and offer whatever quality they have, some good—some bad." "Local produce, especially sweet potatoes, not washed and graded." "Producers take improper care of eggs before marketing; many old eggs are bought locally." "When in season, local vegetables are of higher quality than those shipped in."

3. **Irregularity of Supply.** "Prefer to buy from local producers when produce is available, but irregularity of supply is the big hindrance." "Local farmers cannot be depended on for regular supply. Flood the market this week and have none to offer next week." "We need regular delivery of fresh vegetables and pick-up of those not sold the day before."

Some Experiences of Farmers Trying To Sell Foods Locally

Families in the survey were asked about difficulties of finding a market for the specified foods. Most mentioned the fact that they did not sell the foods mentioned. Nor had most of them any previous experience selling them. Several of those interviewed when asked about difficulties made other comments. These are some of the typical replies: "No difficulty selling, but can't get good price for eggs"; "I couldn't supply demand for dressed chickens, but discontinued raising since my wife and I couldn't continue to dress"; "Customers wanted dressed chickens"; "Yes, had trouble selling pork—everyone had it to sell"; "Had to dispose of my fryers in Jackson at a low price"; "Harder to sell now than years ago. Produce raised in Texas can be brought here earlier and sold cheaper."

HOW INDUSTRY HAS HELPED SALE OF LOCAL FOOD PRODUCTS

Attala County families spent $145 per capita for food during the year 1952-53 according to estimates from survey data obtained in May, 1953. This should mean big business; big business for farmers and food handlers.

But local farmers, it was shown, get relatively little of this business. Income from farm families included in the sample showed that few of them had sold during the report year, broilers, beef, pork, leafy vegetables, sweet potatoes—six of the eight kinds of foods being studied.

The other kinds of foods, eggs and milk, were sold by more farmers. There were good marketing facilities at most food stores for the eggs that were produced. Milk processing facilities (a condensary and creamery) offered a market for milk and cream.

Relatively few families bought directly from local producers, except for eggs. Nor was there a desire on the part of Attala County consumers to buy from local producers. One of the important reasons given by both the urban and rural consumer was the inconvenience of buying from the local producer. Another important reason was lack of, or limited, marketing services provided by the local producer. For example, homemakers want their chickens dressed, their milk pasteurized.

All this means is that for farmers to benefit most from industry, they must sell to processing plants, wholesalers, retailers, who in turn perform certain additional services consumers want.

POSSIBILITIES FOR INCREASED BENEFITS FROM INDUSTRY TO LOCAL FARMERS

From analyses of these data it would seem that there are two things that food handlers, farmers, and other leaders in the county might do now to bring about greater benefit to the farmer from industry: (1) study food processing facilities in the county and make plans for additional ones where desirable; (2) take better advantage of the present situation.

Some farmers in Attala County produce cattle and hogs that would furnish a part of the demand for beef and pork. Yet meat processing facilities are limited to the locker plant operating an abattoir primarily as a service to locker renters and home-freezer users. Meat retailers in the area think that were such facilities available much of the demand for commercial and good grade beef could be supplied by local livestock producers.

Taking better advantage of the present situation will involve: (1) An organized educational program to show producers what the consumers demand in specified foods, and methods and techniques of furnishing such characteristics. There is no reason why local foods should be inferior to shipped-in foods. In fact, there is every reason why the quality of local foods should be superior. (2) More coordination on the part of food handlers and home economists at the local level in promotion of better diets. This survey shows that some Attala County farm families are moving to town; that rural families are shifting from farm to non-farm work and reducing production of food for family use. Such families need help in meal planning. Many are accustomed to eating what they produce and doing without when the supply is used up. Handlers of milk products and home economists might well join forces in expanding the use of milk and its products. The family survey showed that about one-third the urban families and one-fourth the rural families had less of these "protective" foods than recommended by nutritionists.

To be noted here, however, is the fact that Attala County consumers like a wide choice of foods in various forms—that total amounts of food which can be used by a particular family are limited. An increase in use of one type may lead to a decrease in another. Retail grocers might well serve farmers by keeping them posted as to trends in sales.

There is also some long-time planning that food handlers, farmers, and other leaders in the county should be doing now. The family survey showed that higher income families used increasing amounts of animal food products such as beef, pork, broilers, eggs, milk. Long time plans might well be made whereby local producers can get some of the benefits from greater demands for animal products. With expanding industry in the Kosciusko area and accompanying higher incomes there must be food processing facilities if the farmer is to benefit greatly. Production would of course have to be of sufficient volume to justify commercial processing within the area.

SUMMARY

Data for this report were obtained in May, 1953 from a survey of 125 families in Kosciusko and 125 families in rural areas within a 10-mile radius of the city, and from most of the food stores in Kosciusko where the majority of Attala County families traded.

Income per capita for Attala County families, based on incomes of urban

and rural families in the survey during 1952-53, was $641.

Average per capita food expenditures for Attala County, based on expenditures of families in the survey, was $145 or 23% of the income.

When asked to name groceries where they traded 26 percent of the rural families in the survey sample did not mention a Kosciusko grocery. One-half of those families living more than 10 miles from Kosciusko did not mention a Kosciusko grocery (17 percent of the rural families lived from 11 - 14 miles from Kosciusko by way of the road).

The wife (or female head) was the person who most often shopped for food either with or without assistance of husband or others. But men in relatively more rural than urban families shopped for food or assisted in shopping.

The majority of families included in the survey had bought none of the eight kinds of foods being studied (i.e., milk, beef, pork, broilers, eggs, sweet potatoes, tomatoes and leafy vegetables) directly from producers during the year preceding the interview. Eggs was the food most often purchased this way. Furthermore, there was no desire on the part of most consumers to buy from producers. Inconvenience and absence of (or limited) marketing services were the reasons given most often.

A few families both urban and rural purchased beef, pork, broilers, from farmers to put in the home freezer or community locker. This practice may increase in the future provided consumers are satisfied with the meat thus purchased.

The majority of last purchases of each of the specified foods (except eggs) used by rural as well as urban families were made at groceries in Kosciusko.

A comparison of amounts spent for specified foods and foods that competed with them showed large expenditures for competing products. Attala County consumers like many kinds and forms of food. Farmers in Attala County need to study changes in kinds of foods sold at food stores in the county as a basis for planning farm production programs.

Most urban families and about one-half the rural families depend largely on purchases for their food supply.

When the family head in the rural family shifted from farm to non-farm work food production for family use was reduced. When consumption of the specified foods during May is compared with similar data during December, greatest seasonal variation was in types of vegetables used during the two seasons. However, there was variation in certain kinds of meat such as sausage used by relatively more and in larger quantities in December.

Increases in the proportion of families purchasing from lower to higher income group were greatest for animal products, (i.e., beef, pork, broilers, eggs, milk).

Principal reasons given for non-use of the specified foods were: (1) financial; (2) use of similar or other types of foods; (3) dependence on home supply; (4) not liking the food; (5) food not in season (or considered not in season).

Much locally-produced eggs and milk, products for which there were marketing facilities in the area, were handled by Kosciusko food stores. Also certain types of leafy vegetables such as collards and turnip greens, handled by the food stores, were often locally produced.

APPENDIX TABLES

Table 1. Yearly average employment, total payrolls and average wage paid to workers in non-farm industries, Attala County, Mississippi, 1950-53.

Industry group	Average employment			
	1950	1951	1952	1953
Manufacturing:				
Food products	205	221	237	255
Textiles	656	695	621	452
Lumber and wood	359	376	285	229
Printing	10	10	10	12
Vegetable oils	23	31	32	40
Transportation equipment	2	226	324	319
All manufacturing	1,255	1,559	1,509	1,307
Service industries	509	565	546	629
Total non-farm	1,764	2,124	2,055	1,936
	Average wage paid per worker			
	1950	1951	1952	1953
Manufacturing:				
Food products	$2,768	$2,863	$3,233	$3,335
Textiles	1,660	1,734	2,100	1,851
Lumber and wood	1,194	1,318	1,266	1,337
Printing	2,754	2,764	2,877	2,604
Vegetable oils	2,540	2,635	2,795	2,912
Transportation equipment	1,932	2,741	2,797	3,352
All manufacturing	$1,733	$1,964	$2,290	$2,456
Service industries	1,794	1,890	1,995	2,362
Total non-farm	$1,750	$1,944	$2,112	$2,426
	Total payrolls (dollars)			
	1950	1951	1952	1953
Manufacturing:				
Food products	567,381	632,615	766,267	850,425
Textiles	1,088,913	1,205,160	1,303,859	836,509
Lumber and wood	428,694	495,690	360,726	306,083
Printing	27,535	27,635	28,773	31,246
Vegetable oils	58,420	81,688	89,448	116,482
Transportation equipment	3,864	619,521	906,099	1,069,412
All manufacturing	$2,174,807	$3,062,309	$3,455,172	$3,210,157
Service industries	912,936	1,067,658	1,089,466	1,485,673
Total non-farm	$3,087,770	$4,129,967	$4,544,638	$4,695,830

Source: Mississippi Employment Security Commission. **Monthly Employment and Quarterly Wages of Workers Covered by the Mississippi Employment Security Laws, By County, By Industry, For the Calendar Years, 1950-53.**

Table 2. Estimates of total and per capita spendable incomes, Attala County, 1940-53, and comparisons with Mississippi per capita incomes.*

Year	County total	Per capita	Mississippi per capita
1953	$15,765,000	$616	$834
1952	16,903,000	651	826
1951	15,032,000	572	775
1950	15,900,000	597	702
1949	11,641,000	431	638
1948	13,575,000	496	737
1947	13,163,000	475	652
1946	10,498,000	374	574
1945	10,767,000	379	589
1944	10,115,000	351	579
1943	9,710,000	333	485
1942	8,706,000	295	401
1941	6,444,000	216	288
1940	5,147,000	170	204

*A high correlation was found to exist between the Department of Commerce annual estimates of personal income payments for Mississippi and total retail food sales in the state. Food sales in the state and those in Attala County show a similar degree of correlation. On the assumption that food sales in Attala County bear the same relationship to spendable incomes in that county as do food sales in the state to state spendable incomes, the percentage of income spent for food for each year in the state was obtained and applied to county food sales data for that year to obtain the county income estimates. A six-year comparison of the division of the retail sales dollar in the state and county, shown graphically in Figure 3 appears to give validity to the assumption on which this procedure was based. County population data from the 1940 and 1950 Census of Population were used to convert county income estimates to a per capita basis for those years. For other years population estimates used were derived through interpolation between the census years.

Table 3. Total and per capita expenditures for food through retail outlets, Attala County, Mississippi, 1940-54.*

Year	Current dollars		1935-39 dollars	
	Total	Per capita	Total	Per capita
1954	3,284,440	130	1,453,292	58
1953	3,367,330	132	1,489,969	58
1952	3,564,894	137	1,536,532	59
1951	3,108,628	118	1,369,440	52
1950	3,008,294	113	1,414,654	53
1949	2,484,134	92	1,229,693	46
1948	2,554,896	93	1,216,617	44
1947	2,518,028	91	1,297,952	47
1946	1,992,546	71	1,245,341	44
1945	1,617,056	57	1,163,350	41
1944	1,416,083	49	1,041,237	36
1943	1,273,977	44	923,172	32
1942	1,188,413	40	938,398	32
1941	920,126	31	868,043	29
1940	858,058	28	884,565	29

*This table shows both dollar volume of foods sales in the county over 15 years (current dollars) and food sales converted to constant dollar values at the 1935-39 price level for retail foods.

Table 4. Volume of taxable retail sales, by industry groups, Attala County, 1940-52.

Year	Total retail	Food	Furniture and fixtures	Apparel and general merchandise	Automotive	Building	Miscellaneous retail	Miscellaneous services
1954	12,691,450	3,284,440	816,252	2,597,020	2,928,481	1,086,806	1,533,534	445,017
1953	14,437,141	3,367,330	903,008	2,775,228	3,780,366	1,687,277	1,460,797	463,135
1952	15,184,812*	3,564,894	918,906	2,715,064	3,847,267	2,037,805	1,574,461	503,441
1951	14,424,145**	3,108,628	680,900	2,569,642	3,674,668	2,513,680	1,414,015	454,912
1950	12,418,686	3,008,294	445,336	2,399,186	3,522,923	1,380,458	1,346,347	316,142
1949	10,670,899	2,484,134	264,490	2,265,680	3,192,418	1,268,845	876,839	318,493
1948	11,535,162	2,554,896	331,507	2,848,904	3,687,672	1,066,874	676,226	369,083
1947	10,186,314***	2,518,028	286,870	2,592,871	2,570,694	1,127,279	823,662	259,652
1946	8,679,894	1,992,546	288,123	2,387,602	2,029,569	965,028	1,017,026	
1945	5,978,145	1,617,056	180,990	2,007,165	1,038,038	365,756	769,140	
1944	5,388,370	1,416,083	139,464	1,885,032	853,405	403,237	691,149	
1943	4,668,295	1,273,977	128,969	1,669,266	657,891	336,275	601,917	
1942	4,201,707	1,188,413	81,518	1,435,862	701,780	316,368****	477,766	
1941	3,472,720	920,126	82,808	939,478	874,145	327,466	328,697	
1940	3,043,537	858,058	52,612	891,234	647,252****	233,929****	360,452	

Source: Mississippi State Tax Commission Service Bulletins Nos. 29, 31, 33, 35, 37, 39, 41, 43, 45, 46 49, and unpublished data, Mississippi State Tax Commission.

*Includes 22,974 natural resources.

**Includes 7,700 natural resources.

***Includes 7,258 natural resources.

****Estimates.

Table 5. Percentage of urban and rural families using specified foods from any of one or more sources (bought, home-produced, gifts) and from purchase only by income groups.

Foods	Percent who used any from one or more sources								Percent who used bought only							
	Urban				Rural				Urban				Rural			
	$1170 and under	$1171-2210	$2211-3810	$3811 and over	$1170 and under	$1171-2210	$2211-3810	$3811 and over	$1170 and under	$1171-2210	$2211-3810	$3811 and over	$1170 and under	$1171-2210	$2211-3810	$3811 and over
Cabbage	88	71	54	60	78	74	87	79	56	29	17	33	16	24	27	16
Mustard greens	25	43	32	30	42	33	27	21	6	7	5	13	2	2	0	0
Turnip greens	63	54	49	40	71	50	33	42	19	4	15	15	7	7	0	0
Beef roast	0	14	32	50	7	4	47	42	0	14	32	45	7	4	27	32
Hamburger	19	25	46	45	9	13	60	84	19	21	46	40	9	11	40	63
Beef steak	13	29	54	80	13	26	53	63	13	25	54	70	4	22	33	42
Bacon	38	71	93	95	42	59	100	89	38	61	80	90	24	43	67	47
Pork chops	19	46	39	53	9	17	20	26	19	46	39	50	4	15	0	16
Sausage	25	50	49	28	24	22	33	37	25	39	44	25	13	13	20	16
Ham	6	21	27	55	22	37	40	42	0	14	22	50	0	13	20	26
Salt pork	56	57	32	38	67	54	33	53	44	46	29	35	24	28	20	21
Broilers	38	61	85	70	27	50	80	84	31	54	80	65	11	24	33	47
Eggs	94	96	100	98	96	96	93	100	50	61	90	78	22	28	53	47
Whole milk	63	82	98	93	82	85	93	95	50	61	80	80	18	43	47	58
Buttermilk	94	75	78	58	80	63	80	89	69	61	61	55	22	28	33	47
Sweet potatoes	0	4	15	10	0	0	0	0	0	4	15	10	0	0	0	0
Fresh tomatoes	19	36	83	85	27	17	67	63	19	36	83	85	27	17	67	63
Total families	16	28	41	40	45	46	15	19	16	28	41	40	45	46	15	19

Table 6. Average amount specified purchased foods used by urban and rural families using during report week, May 1953, by income groups.

Food	Urban families				Rural families			
	$1170 and under	$1171-2210	$2211-3810	$3811 and over	$1170 and under	$1171-2210	$2211-3810	$3811 and over
Beef steak lbs.	1.5	2.0	2.1	2.7	1.5	2.1	2.8	2.8
Beef roast lbs.	0	2.8	2.7	3.4	0	3.5	3.4	3.0
Beef hamburger lbs.	1.3	1.4	1.8	1.7	1.8	2.0	2.0	1.7
Broilers lbs.	2.2	2.3	2.7	3.1	2.3	2.4	2.6	3.2
Sausage	1.3	1.9	1.6	1.6	1.3	1.4	1.0	1.7
Ham lbs.	0	1.1	1.6	2.5	0	2.1	1.2	1.3
Salt pork lbs.	2.6	1.6	1.6	1.1	2.2	2.4	1.3	.9
Bacon lbs.	1.7	1.4	1.7	1.7	2.0	1.8	1.9	1.5
Pork chops lbs.	1.2	1.9	1.7	1.6	2.0	1.7	0	1.7
Fresh tomatoes lbs.	.8	2.3	1.8	2.4	3.2	2.3	2.4	2.3
Sweet potatoes lbs.	0	3.0	2.5	3.0	0	0	0	0
Cabbage lbs.	6.7	2.8	3.2	2.6	5.0	2.8	2.6	2.3
Mustard lbs.	4.0	3.5	1.3	1.4	1.0	1.0	0	0
Turnip greens lbs.	1.3	6.0	1.4	1.3	1.3	1.0	0	0
Whole milk qts.	2.4	9.9	8.6	14.4	6.0	8.2	8.2	10.7
Buttermilk qts.	4.2	4.3	3.2	2.9	6.0	4.2	3.2	2.9
Eggs doz.	1.4	1.8	2.0	2.8	1.7	2.2	2.1	2.1
No. families	16	28	41	40	45	46	15	19

Table 7. Average amount specified foods used (all sources) by urban and rural families using during report week, May 1953, by income group.

Food	Urban families				Rural families			
	$1170 and under	$1171-2210	$2211-3810	$3811 and over	$1170 and under	$1171-2210	$2211-3810	$3811 and over
Cabbage lbs.	5.5	3.9	4.9	3.2	5.6	6.3	3.6	4.9
Mustard greens lbs.	2.7	4.0	1.9	2.1	1.7	2.4	1.8	1.6
Turnip greens lbs.	1.8	3.9	2.0	1.7	2.3	2.3	2.4	2.2
Beef roast lbs.	0	2.8	2.6	3.1	2.3	3.5	2.8	2.8
Hamburger beef lbs.	1.3	1.4	1.7	1.7	1.8	1.8	1.7	1.8
Beef steak lbs.	1.5	2.0	2.1	2.8	4.5	2.6	2.3	2.5
Bacon lbs.	1.7	1.4	1.7	1.6	2.1	1.8	1.8	1.6
Pork chops lbs.	1.2	1.9	1.7	1.7	1.7	1.6	1.5	1.6
Sausage lbs.	1.2	1.9	1.8	1.6	1.5	1.4	1.0	1.9
Ham lbs.	3.0	1.2	2.1	2.6	2.7	2.8	1.6	1.6
Salt pork lbs.	2.8	1.5	1.6	1.1	2.4	2.2	1.4	1.1
Broilers lbs.	2.1	2.3	2.8	3.0	3.3	3.5	2.9	3.1
Eggs doz.	1.5	1.9	2.2	3.0	1.8	2.2	2.5	2.7
Whole milk qts.	3.5	10.3	9.0	14.0	12.3	11.7	14.6	15.0
Buttermilk qts.	3.9	4.8	3.7	3.0	8.4	9.5	6.7	4.1
Sweet potatoes lbs.	0	3.0	2.5	3.0	0	0	0	0
Fresh tomatoes lbs.	.8	2.3	1.8	2.4	3.2	2.2	2.4	2.2
Number families	16	28	41	40	45	46	15	19

Table 8. Reasons most often given by homemakers for non-use of specified foods during report week, May 1953 (listed in order of importance).

Food	Urban	Rural
Whole milk	No money, costs too much Don't drink Don't like	No money, costs too much Don't buy when cow dry Don't drink
Buttermilk	Never use Had no use for in menu Don't like	Never use Had no use for in menu
Broilers	No money, costs too much Used other kinds of meat	Never purchase; depend on home supply Used other kinds of meats
Eggs (few did not use)	No money, costs too much	Hens didn't lay
Ham	No money, costs too much Used other kinds of meats or cuts	No money, costs too much Used other kinds of meats or cuts
Pork chops	No money, costs too much Used other meats or cuts Not in season	No money, costs too much Used other meats or cuts
Bacon	No money, costs too much Used other kinds of meats	No money, costs too much Used other kinds of meats
Sausage	Used other kinds of meats Not in season	Used other kinds of meats Depend on home supply; never buy
Fresh tomatoes	No money, costs too much Had other kinds of vegetables	No money, costs too much My tomatoes not ripe, waiting for home supply
Cabbage	Don't like much Had other things this week	Had other things this week Don't like so well
Turnip greens	Used other vegetables instead Don't like so much	Do not purchase Use own supply—Now gone to seed Used other vegetables
Beef steak	No money, costs too much Used other meats or cuts	No money, costs too much Used other meats or cuts
Beef roast	No money, costs too much Used other meats or cuts	No money, costs too much Used other meats or cuts
Beef hamburger	Used other meats or cuts Don't like so well	No money, costs too much Used other meats or cuts
Mustard greens	Using other vegetables this week Depend on home supply	Depend on home supply Used other kinds of vegetables this week
Sweet potatoes	No money, costs too much Used other things this week	No money, costs too much Depend on home supply; don't purchase

Table 9. Percentage of rural and urban families selling during year preceding interview some of the specified products.

Product	Rural	Urban
Milk and cream	23	1
Eggs	33	4
Broilers	5	1
Beef*	10	1
Pork*	6	1
Leafy vegetables	3	2
Sweet potatoes	2	0
Tomatoes	2	3

*To retailers or families for use as meat. But about 15 percent of the rural families sold cattle including animals and beef for meat; 9 percent of the rural families sold hogs, pigs, including pork for meat. Two percent of the urban families sold cattle including animals and beef for meat.

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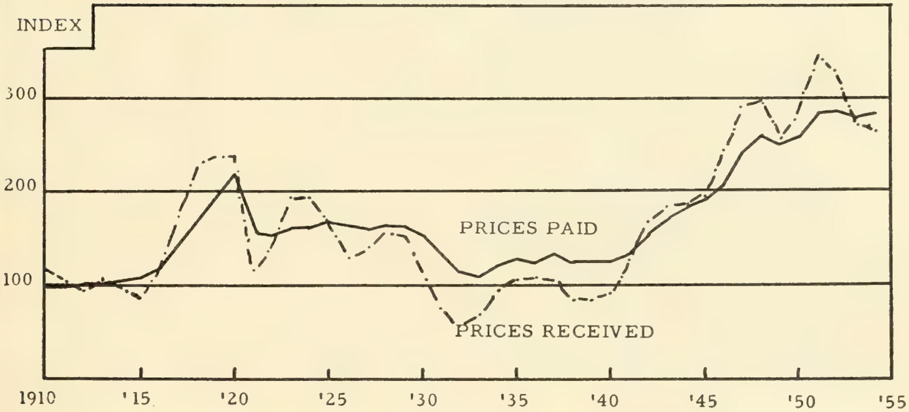
BULLETIN 535 AUGUST, 1955

Prices Received and Paid By Mississippi Farmers and Index of Seasonal Variation In Farm Prices 1910-1955



INDEX OF PRICES PAID BY FARMERS AND INDEX PRICES RECEIVED BY MISSISSIPPI FARMERS, 1910-54. (1910-14 = 100)

Both prices paid by farmers and prices received by Mississippi farmers have fluctuated widely during the period 1910-54. However, prices received by Mississippi farmers have been subject to the wider fluctuations. In periods of low prices, prices received by Mississippi farmers have fallen more than prices paid. In periods of high prices the reverse has been true.

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ACKNOWLEDGEMENTS

The primary purpose of this publication is to serve as a ready reference for price information. Monthly prices will be published in a later bulletin by the Mississippi Experiment Station in cooperation with the United States Department of Agriculture. Vocational agricultural teachers and others desiring to keep their file of price information up to date can do so by consulting the article entitled "Mississippi Farm Price and Outlook Situation" in each monthly issue of the "Mississippi Farm Research."

Mr. James F. Abel and Mr. J. E. Betts, students in the Department of Agricultural Economics, did most of the tabulation and computation. Mrs. Lois Ann Smith and Mrs. Mary Lou Moffett prepared the charts.

SUMMARY

During the 1910 - March, 1955 period, prices of farm products produced in Mississippi have been subject to extreme fluctuations. In addition, price relationships between commodities have undergone considerable change.

A comparison of the lowest monthly prices for the entire period with the highest monthly prices for the period showed the following percentage increases: Beef cattle, 1,236; butterfat, 627; calves, 1,045; chickens, 327; corn, 635; cotton, 650; cottonseed, 1,011; eggs, 787; hay, 405; hogs, 717; lambs, 755; milk, 500; milk cows, 1,024; oats, 353; potatoes, 500; sheep, 477; soybeans, 331; sweet potatoes, 1,238; turkeys, 444; and wool, 1,328.

In 1954 a given amount of all farm commodities would have exchanged in the market place for an average of 6 percent less than during the base period 1910-14. However, a given amount of sweet potatoes, milk cows, calves, hogs, lambs, and wool would have exchanged for more than during the 1910-14 period. The purchasing power of cotton was the same as during the base period while that of the other major farm commodities (cottonseed, corn, oats, hay, soybeans, potatoes, milk, butterfat, beef cattle, chickens, eggs, turkeys, and sheep) was less.

Egg prices showed the greatest seasonal variation. The usual change in egg prices from the low month to the high month for the same year was 76 percent. The usual change in sweet potato and potato prices was 46 and 41 percent, respectively. Wool and milk cows showed much less seasonal variation in prices, and increase of 5 and 6 percent, respectively, from the low month to the high month.

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Prices Received and Paid By Mississippi Farmers and Index of Seasonal Variations In Farm Prices, 1910-1955.

By

Thomas E. Tramel and David W. Parvin

During the past 45 years there has been considerable variation in prices received for Mississippi farm commodities, both within years and between years. There is little if anything that the individual farmer can do towards controlling these variations. However, knowledge of variations which have occurred in the past form some basis for planning for the future. In addition, knowledge of the usual price relationships which have existed in the past should be very helpful. Briefly, the purpose of this publication is to provide historical information on prices which will enable farmers to make intelligent decisions regarding what to produce and when to market. Agricultural workers and farmers who wish to keep a current file on Mississippi farm prices may do so by consulting a monthly article published in the "Mississippi Farm Research."

Sources of Data

Monthly prices for Mississippi farm commodities were obtained from three sources: (1) "Prices of Farm Products Received by Producers," U.S.D.A. Statistical Bulletin No. 16, (2) "Crops and Markets," a monthly publication of the U.S.D.A. from 1925 through 1942, and (3) "Agricultural Prices," a monthly publication of the U.S.D.A. since 1942. The index of prices paid by farmers, the index of prices received by farmers, and the parity ratio for farmers of the United States were from the latter source also. Farm income data were taken from "The Farm Income Situation," monthly publication of the U.S.D.A.

Definitions

Price Relative. A price relative is the price of one commodity reduced to a percentage of its price during a designated base period. For example, a price relative of 120 for cotton means that the price of cotton is 20 percent higher at that particular time than it was in the base period. It is difficult to make comparisons of price changes when one commodity is quoted in cents per pound, another in dollars per ton, another in cents per bushel, and another in dollars per hundredweight. Price relatives facilitate a comparison.

Index Number of Farm Prices. An index number of farm prices is the prices of a group of farm commodities reduced to a percentage of their prices during a designated base period. For example, a price index number of 90 means that farm prices as a group are 10 percent lower than they were during the base period. Index numbers of farm prices facilitate the study of the relationship of the prices paid by farmers to the prices received for farm products, and of the relationship of prices of individual farm commodities to the level of prices for all farm products.

Parity Ratio. Parity ratio, or the ratio of prices received to prices paid, expresses the purchasing power of a specified amount of farm commodities as a percentage of what they would purchase during a designated base period. For example, a parity ratio of 110 means that a specified amount of farm products will purchase 10 percent more of the items farmers ordinarily buy during the period under consideration than it would in the base period. Parity ratio is used as a measure of the well-being of farmers in terms of unit prices. Farmers are said to be in a favorable price position when the parity ratio is above 100 and in an unfavorable price position when the parity ratio is below 100.

Index Number of Purchasing Power. An index number of purchasing power expresses the purchasing power of one unit of a specified product as a percentage of what it would purchase during a designated base period. For example, an index of purchasing power of 75 for milk means that 100 pounds of milk would buy 25 percent less of the items farmers ordinarily buy at that particular time than it would in the base period. These index numbers facilitate comparison of changes in the relative purchasing power of various farm commodities.

Index Number of Seasonal Variation. This index number expresses the average price for each month as a percentage of the annual average price. For example, an index of 112 for the price of eggs in January means that the average price of eggs during January for the period under consideration (1946-1954) was 12 percent above the annual average. Likewise an index of 79 for the price of eggs in May means that the average price for that month was 21 percent below the annual average. Index numbers of seasonal variation are used to show the usual or average fluctuations in prices from month to month. They should be taken into consideration in planning production and marketing.

Coefficient of Variation. This measure is used to compare fluctuations away from the average prices for two or more commodities. The commodity having the largest coefficient of variation is subject to larger variations away from the average price for the period than commodities having a smaller coefficient of variation. Conversely, the price for commodities having a low coefficient of variation is more stable than for commodities having a high coefficient of variation.

Methods of Construction

Price Relatives and Index Numbers. January 1910 - December 1914 was used as the base period. This period is the base period used by the U.S.D.A. for computing price relatives and index numbers for the United States. Thus, the figures for Mississippi and for the United States are comparable in this respect.

Weights used in the computation of the index of prices received by Mississippi farmers for 1910-1950 were based on the contribution of each commodity to the total farm income of the State during 1945-1949. (See Table 54.) For the period 1951 - March 1955, rice was included in the determination of the index in accordance with its contributions to farm income since 1951. For examples of calculations of price relatives and index numbers of prices received see Table 53.

Parity Ratio. Parity ratios for Mississippi farmers were obtained by dividing the index of prices received by Mississippi farmers by the index of prices paid by farmers and multiplying the resulting figure by 100. The following calculation serves as an example:

Index prices received by Mississippi farmers, 1954 = 265

Index of prices paid by farmers, 1954 = 281

$$\text{Parity ratio, 1954} = \frac{265}{281} \times 100 = 94.$$

Index Numbers of Purchasing Power. The index of purchasing power of the different farm commodities was calculated by dividing the price relative for a commodity by the index of prices paid by farmers and multiplying the resulting figure by 100. The following calculation for cotton for 1954 serves as an example:

Price relative for cotton = 280

Index of prices paid by farmers = 281

Index number of purchasing power

$$\text{of cotton} = \frac{280}{281} \times 100 = 100.$$

Index Numbers of the Average Seasonal Variation. The procedure for calculating this index is much too long to be presented here. It is fairly simple, however, and a very good description of the procedure can be found in "Elementary Statistics" by Morris Myer Blair, published by Henry Holt and Company, New York, 1952.

Coefficient of Variation. Calculation of the coefficient of varitation is too complicated for presentation in a publication of this type. However, for those who are interested in the procedure see the reference quoted immediately above.

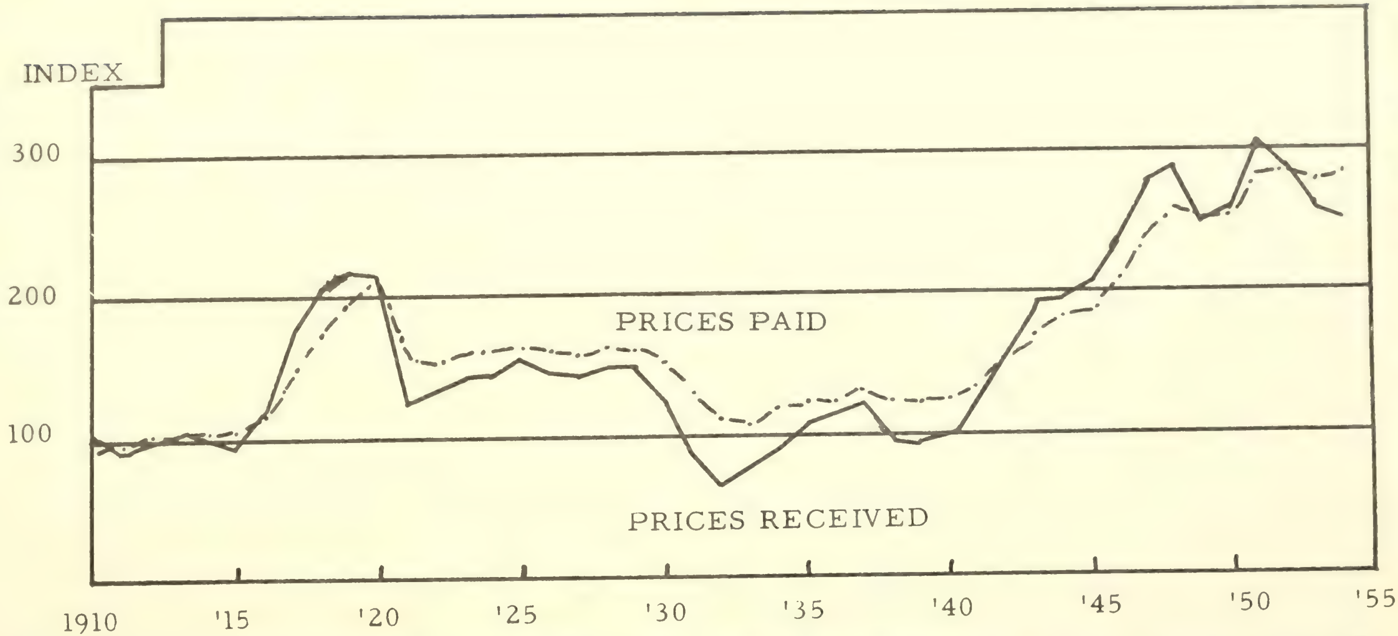

Figure 1. INDEX OF PRICES PAID BY FARMERS AND INDEX OF PRICES RECEIVED BY FARMERS, U. S., 1910-54 (1910-14 = 100)

Prices received by farmers of the nation as a whole have fluctuated more than prices paid. Generally, prices received fell to lower levels in periods when all prices were low but rose to higher levels when all prices rose than did prices paid by farmers.

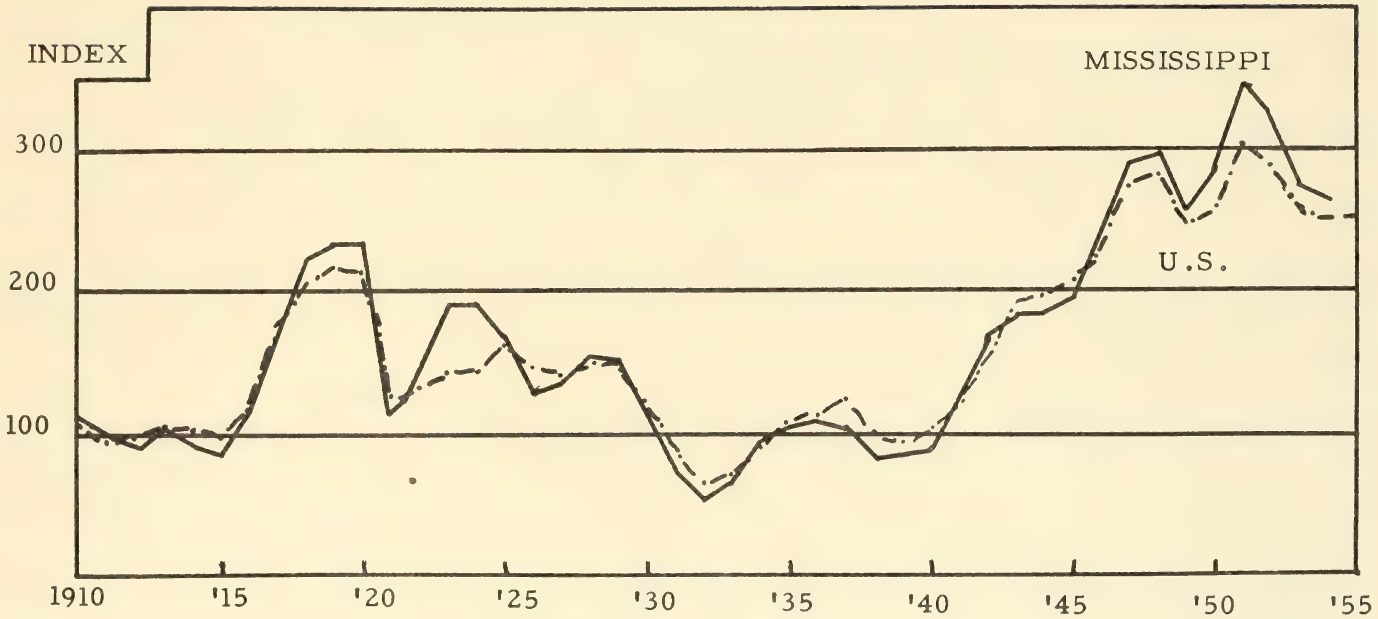

Figure 2. INDEX OF PRICES RECEIVED BY FARMERS, MISSISSIPI AND U. S., 1910-54, (1910 - 14 = 100)

Prices received by Mississippi farmers fluctuated more during the period 1910-54 than did prices received by farmers of the nation as a whole. This was brought about primarily by the price of cotton fluctuating more than the average for all commodities produced in the United States.

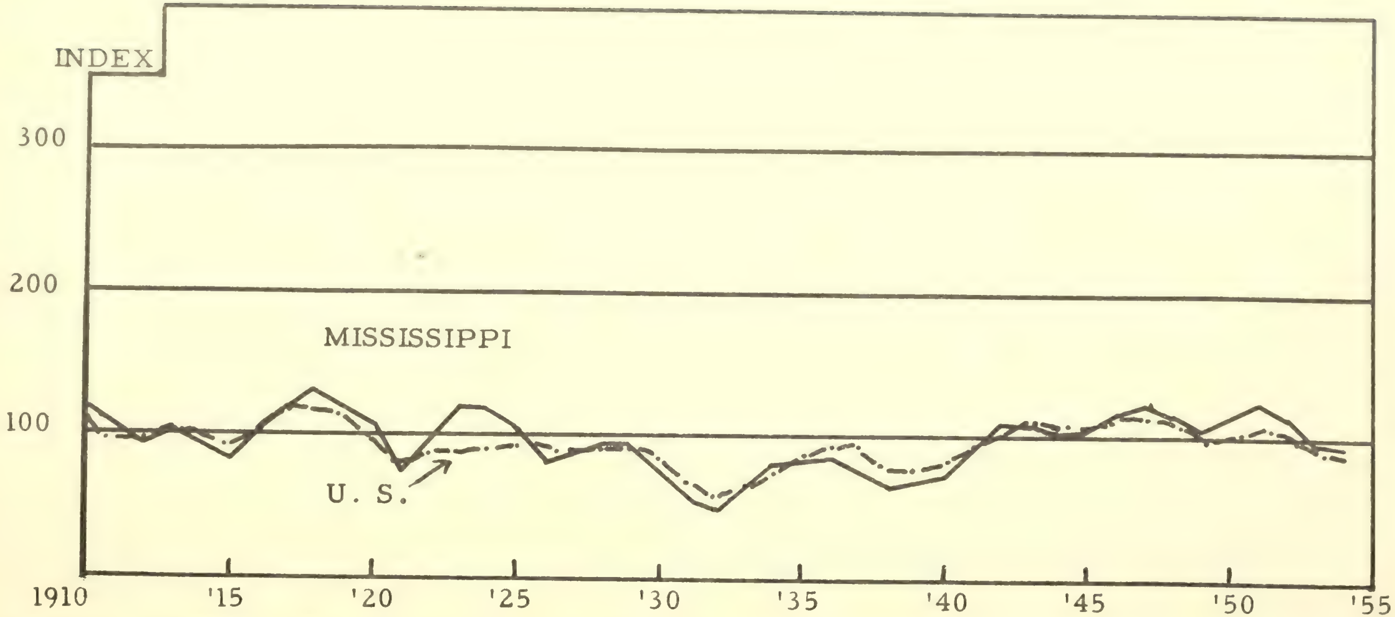

Figure 3. PARITY RATIO, MISSISSIPPI AND U. S., 1910 - 54. (1910 - 14 = 100)

Since prices received by farmers and prices paid by farmers tend to move in the same direction, the parity ratios have not fluctuated nearly as much as either prices received or prices paid. This ratio generally has been below 100 in periods of low prices and above 100 in periods of high prices, but 1953 and 1954 are exceptions.

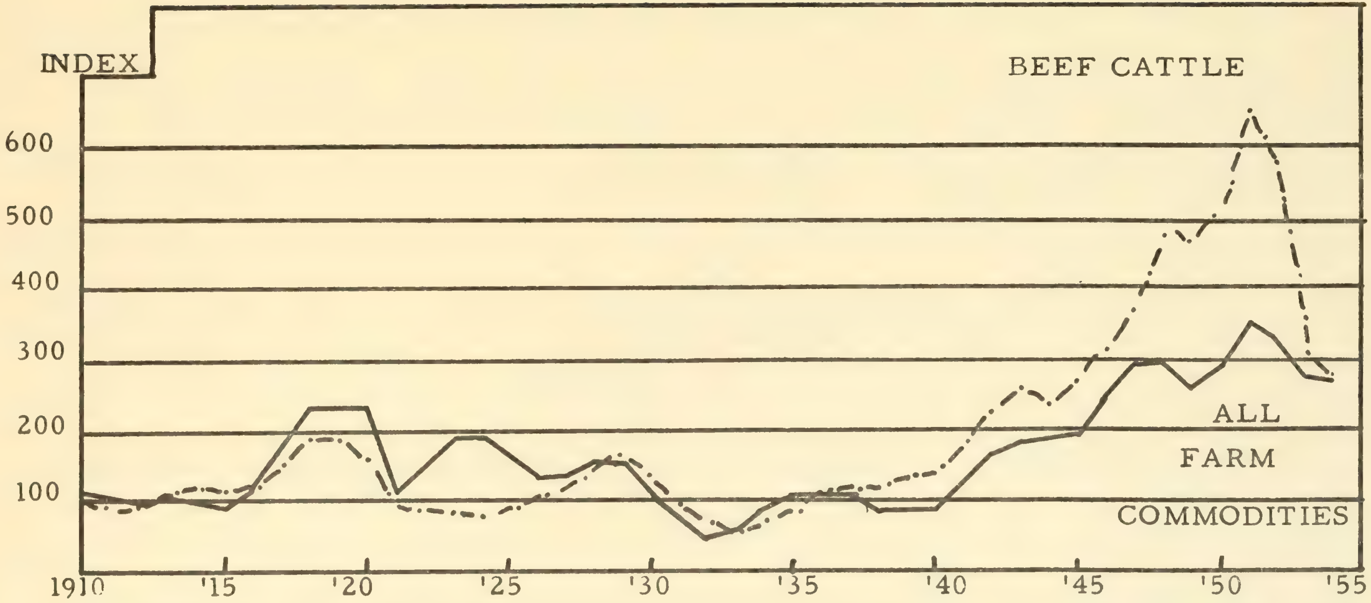

Figure 4. INDEX OF BEEF CATTLE PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910 - 54. (1910-14 = 100)

Since 1936 beef cattle prices have been subject to much wider fluctuations than the average of all commodities produced by Mississippi farmers. Up until that time they were more stable. Compared to the base period relationship, beef cattle prices were low until 1928 and high since 1936. During World War II and until 1951, prices of beef cattle increased almost twice as much as the average for all farm commodities. By 1954 the relationship was almost the same as during the base period 1910-14.

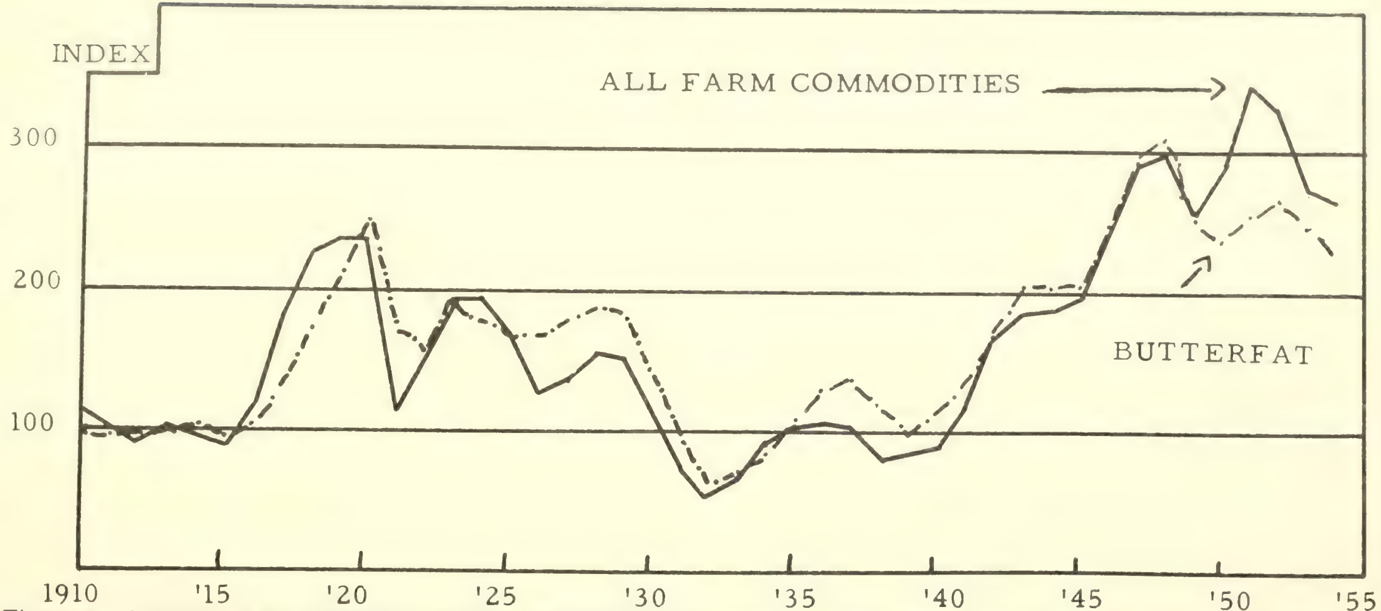

Figure 5. INDEX OF BUTTERFAT PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910 - 54. (1910 - 14 = 100)

Prices received by Mississippi farmers for butterfat compared to prices received for all farm commodities have generally been more favorable during periods of falling prices and periods of relatively low prices than periods of high prices. Since 1949, butterfat prices have been relatively unfavorable. Fluctuations in butterfat prices have been about the same as the average for all farm commodities.

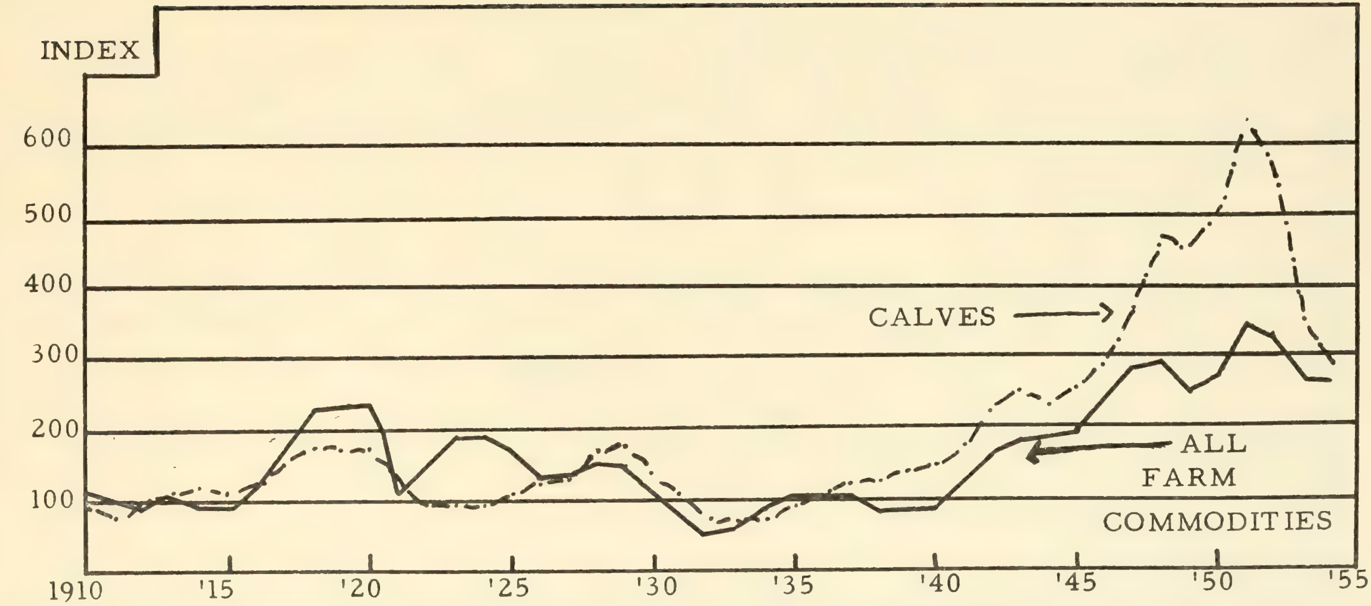

Figure 6. INDEX OF CALF PRICES, COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

From 1910 to 1936 prices received by Mississippi farmers for calves fluctuated less than the average for all commodities. Since 1936 they have fluctuated more. During World War II and until 1951 prices of calves rose almost twice as much as the average for all commodities. By 1954 the relationship was almost the same as during the base period 1910-14.

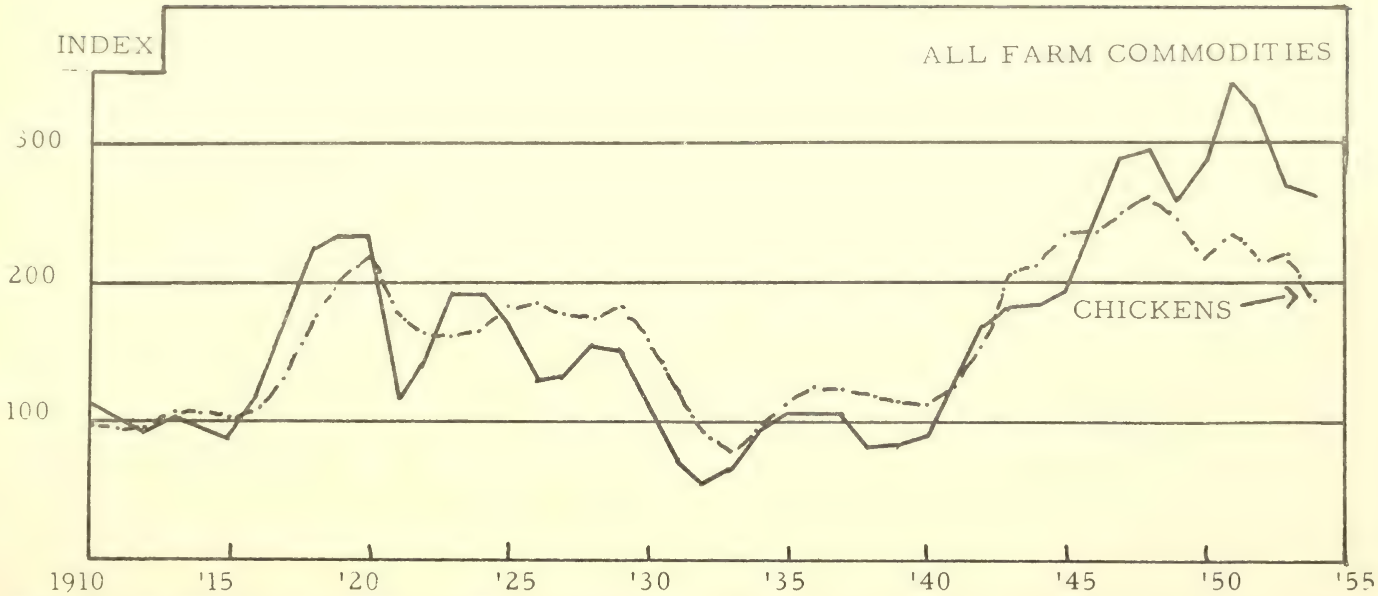

Figure 7. INDEX OF CHICKEN PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910 - 54. (1910 - 14 = 100)

Chicken prices did not vary as much during the 1910 - 54 period as prices of all commodities taken together. Generally, when compared to prices of all farm commodities, chicken prices have been more favorable in periods of falling prices and in periods of relatively low prices than in periods of rising prices or periods of relatively high prices.

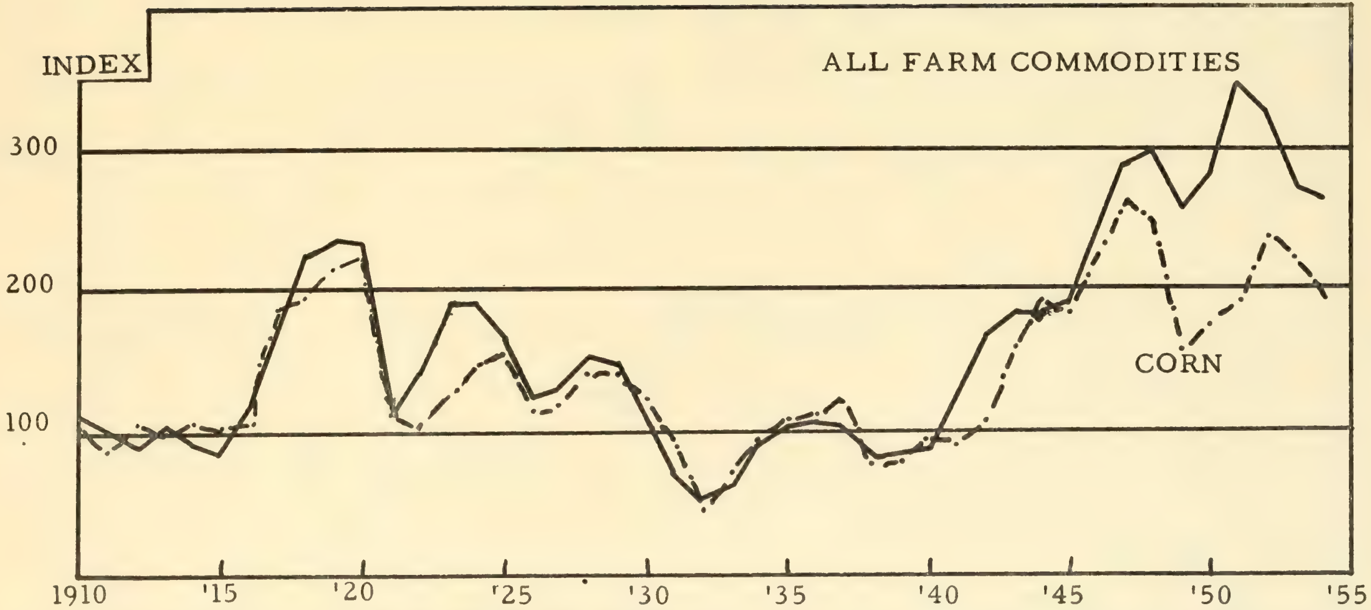

Figure 8. INDEX OF CORN PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Corn prices were subject to about the same variability as prices of all farm commodities during the 1910-54 period. From 1910 to 1940 corn prices just about kept pace with changes in the index of prices received for all farm commodities. Since 1940, the rise in corn prices has not been as great as the rise in the average prices of all farm commodities.

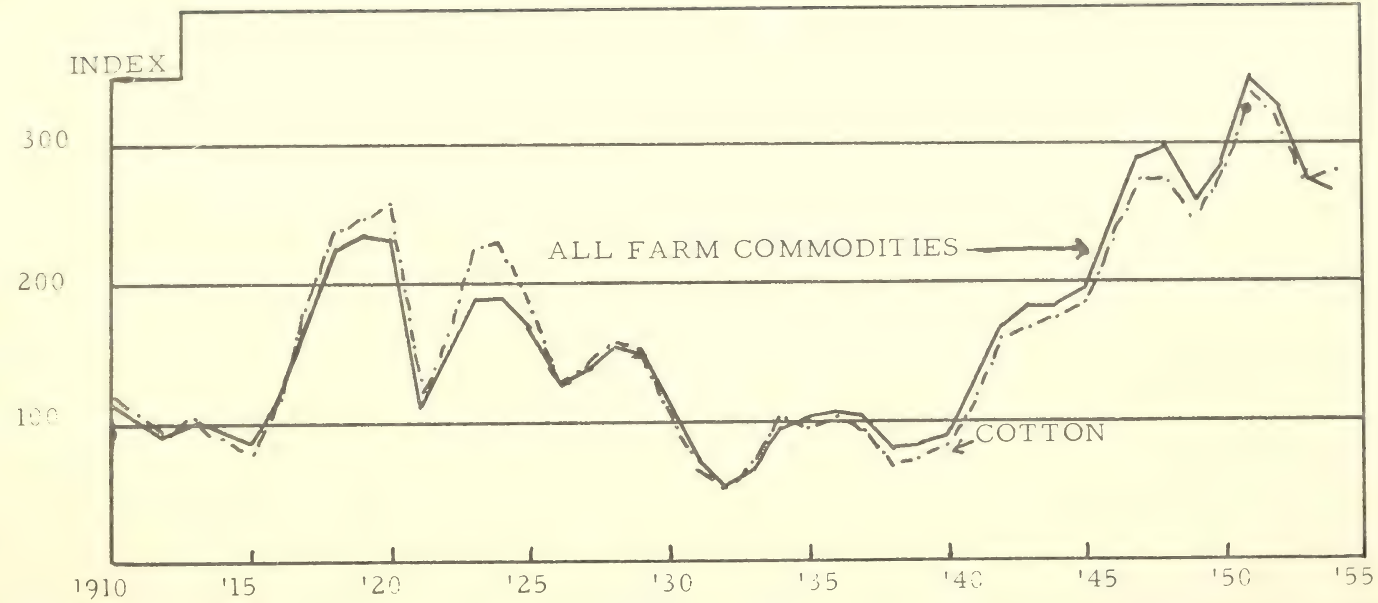

Figure 9. INDEX OF COTTON PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, 1910 - 54. (1910-1914 = 100)

Prices of cotton, the most important farm commodity in Mississippi, have usually moved in the same direction and to about the same extent as the average for all commodities. Cotton prices are weighted over 6 times as heavily in calculating the average for all commodities as any other single commodity. This helps to explain the closeness of the two indexes over the 1910-54 period. From 1935 to 1953 cotton prices were below their base period relationship to the prices of all Mississippi farm commodities.

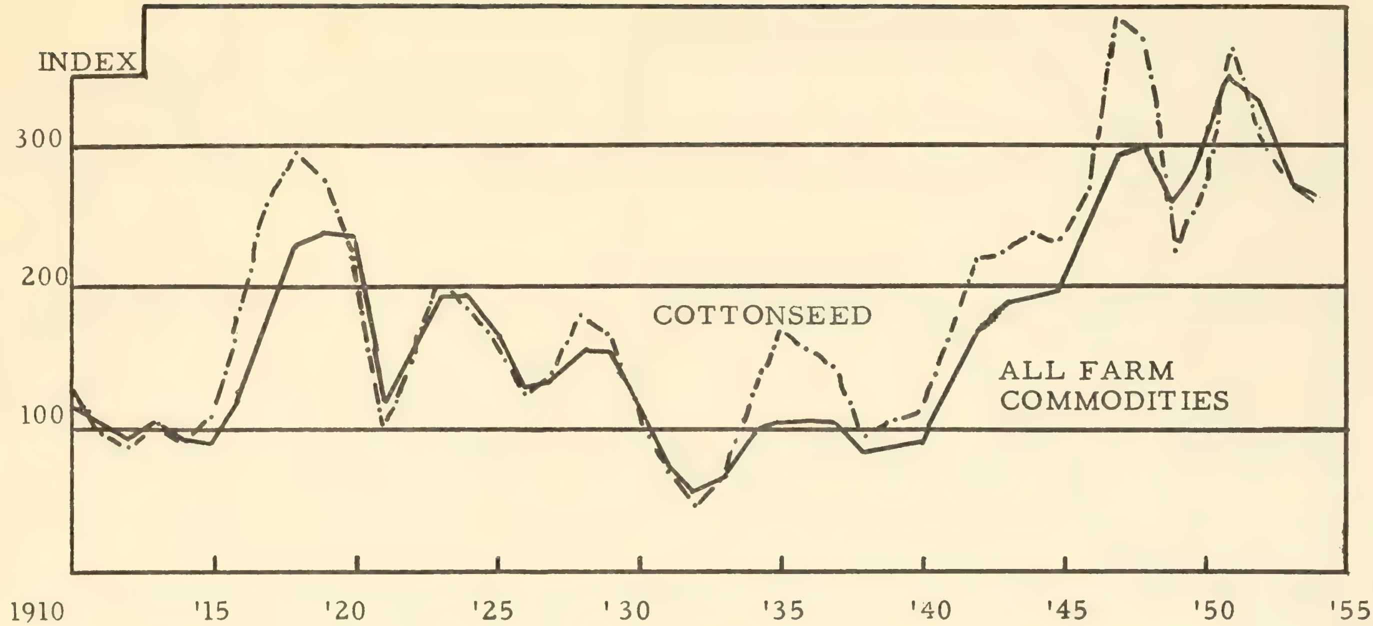

Figure. 10. INDEX OF COTTONSEED PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Year-to-year changes in cottonseed prices have in most instances been greater than the average for all farm commodities. In general, in periods of rising prices, cottonseed prices have been above their 1910-14 relationship to the prices of all farm commodities.

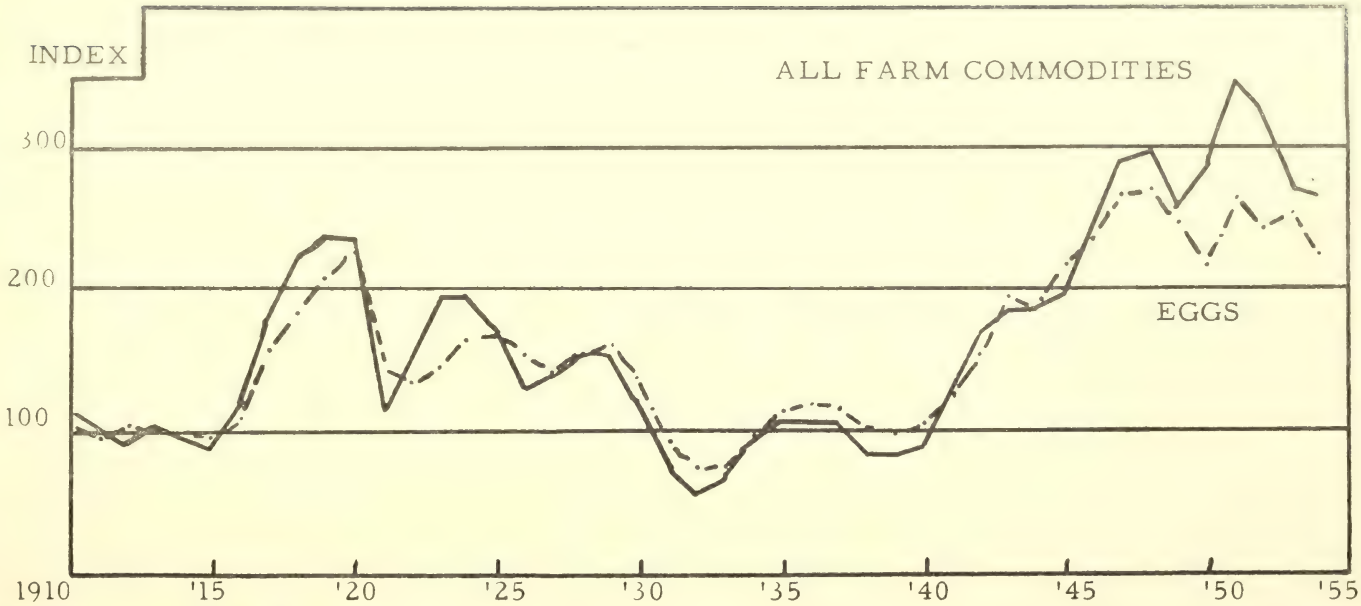

Figure 11. INDEX OF EGG PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Year-to-year changes in egg prices were slightly less than changes in the average price of all farm commodities. Departures from the 1910-14 relationship were of minor importance up to 1949. Since that time egg prices have been unfavorable compared to the 1910-14 relationship to the prices of all farm commodities taken together.

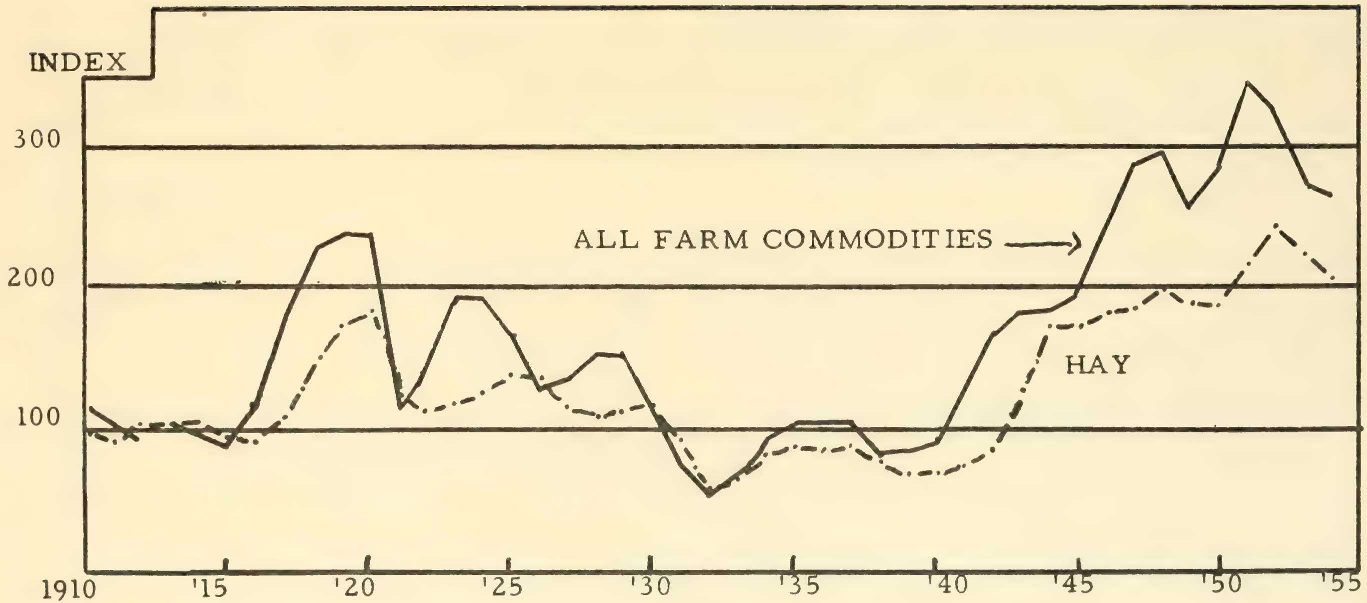

Figure 12. INDEX OF HAY PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

In periods of rising prices, hay prices have usually lagged behind the rise in prices of all Mississippi farm commodities. Since 1933 hay prices have been below their 1910-14 relationship to prices of all farm commodities. For most of the period 1916 to 1930 the same situation was true.

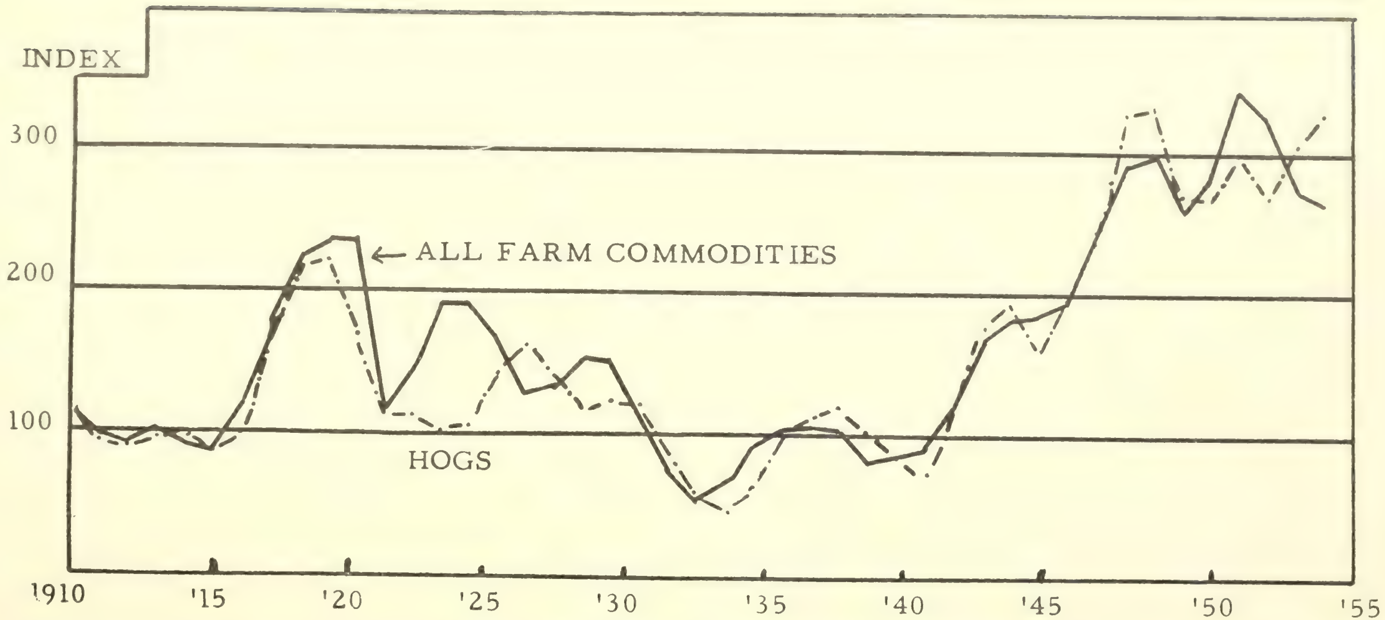

Figure 13. INDEX OF HOG PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

In general, hog prices have been high when prices of all farm commodities have been high. However, year-to-year changes have sometimes been in opposite directions. Hog prices fluctuated slightly more than the all commodity index during the 45-year period.

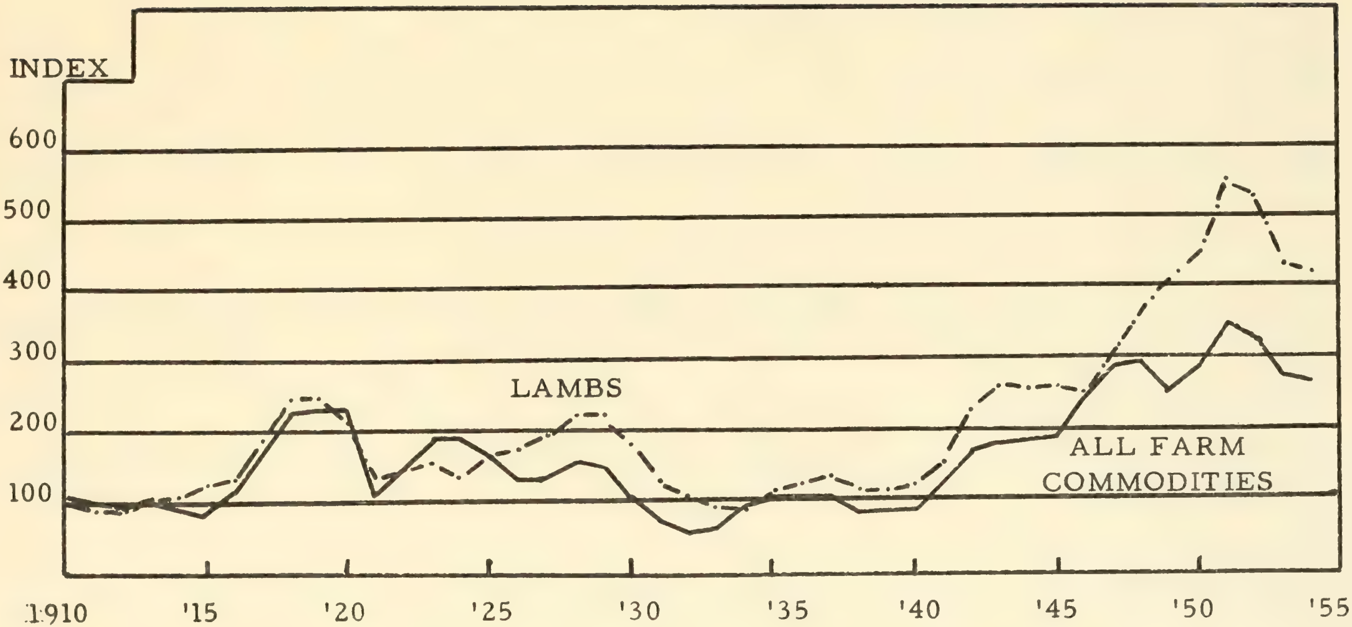

Figure 14. INDEX OF LAMB PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Lamb prices have generally been more favorable than the average price for all farm commodities since the 1910-14 base period than during this period. Since 1946, Lamb prices have tended to become relatively even more favorable.

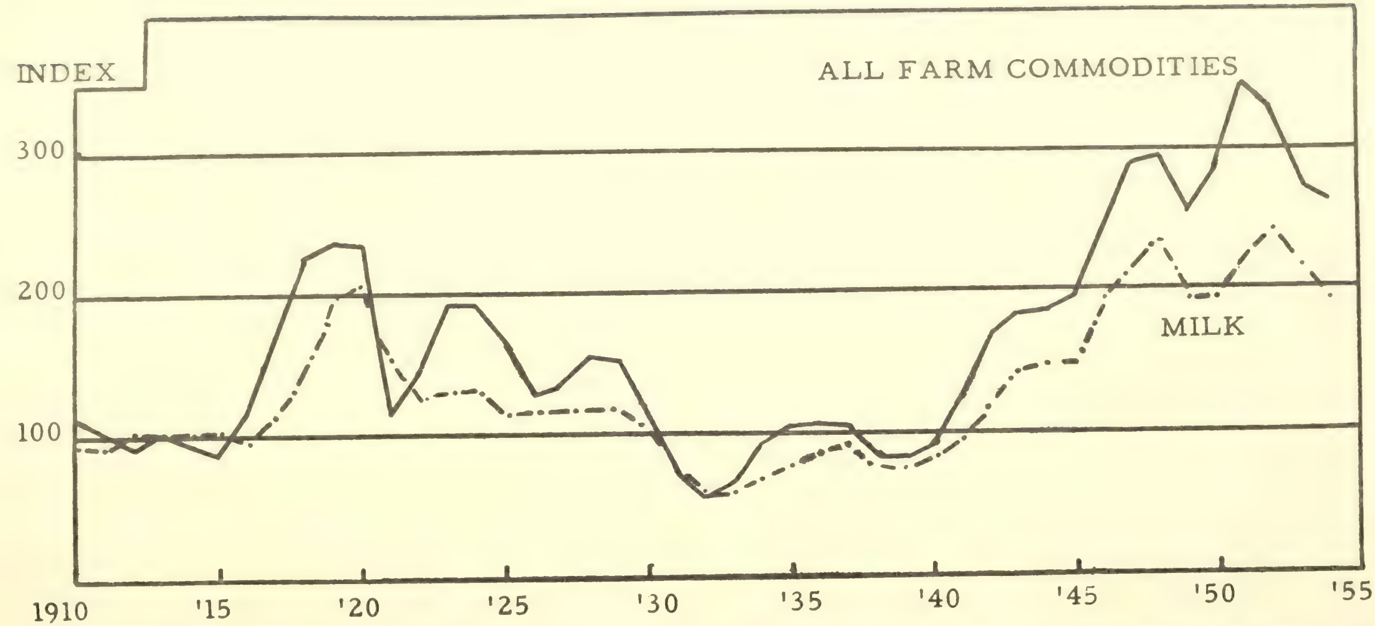

Figure 15. INDEX OF MILK PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Milk prices have been more stable than the average of all farm prices during the 45-year period. From 1916 to 1933 prices of milk were generally below the 1910-14 relationship to the average of all farm prices. Since 1933 milk prices have been consistently below this relationship.

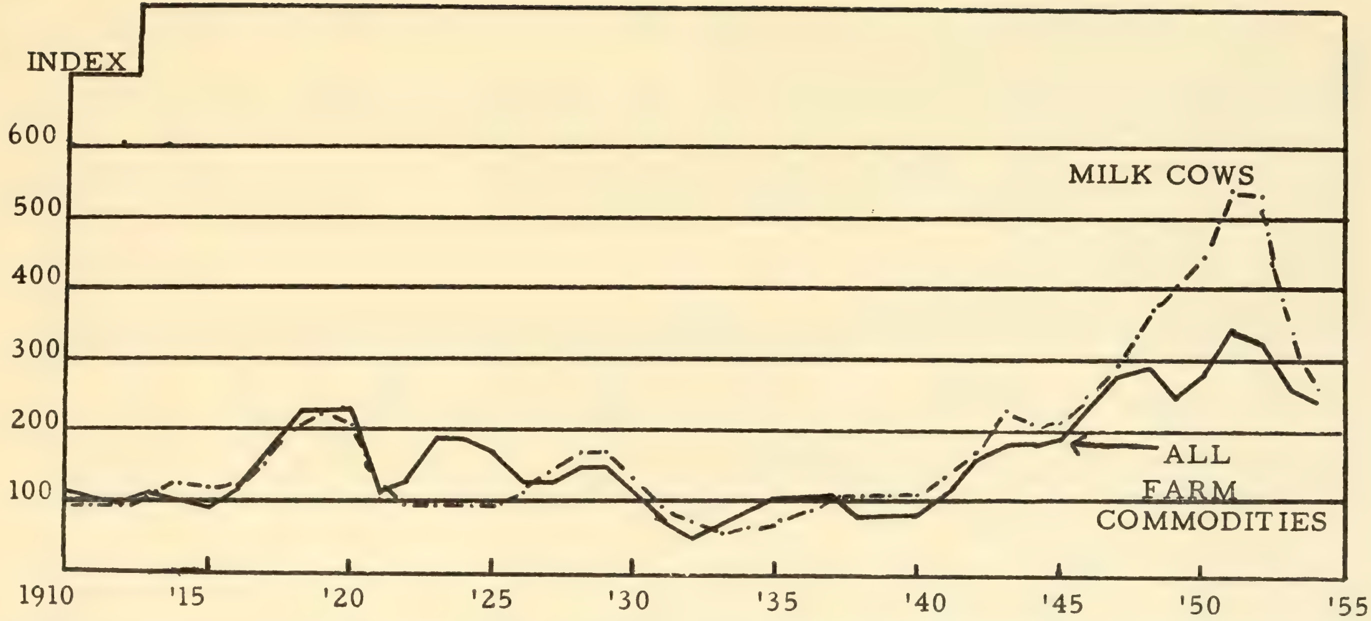

Figure 16. INDEX OF MILK COW PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910 - 54. (1910 - 14 = 100)

Generally, prices received by farmers for milk cows have moved in the same direction as prices of all Mississippi farm commodities taken together. However, following the agricultural depression of 1921, milk cow prices did not recover when prices of all farm commodities rose. Also, milk cow prices continued to rise while the average price of all farm commodities declined in 1949. The decline in milk cow prices from 1952 to 1954 was sharper than the decline for the all farm commodities index.

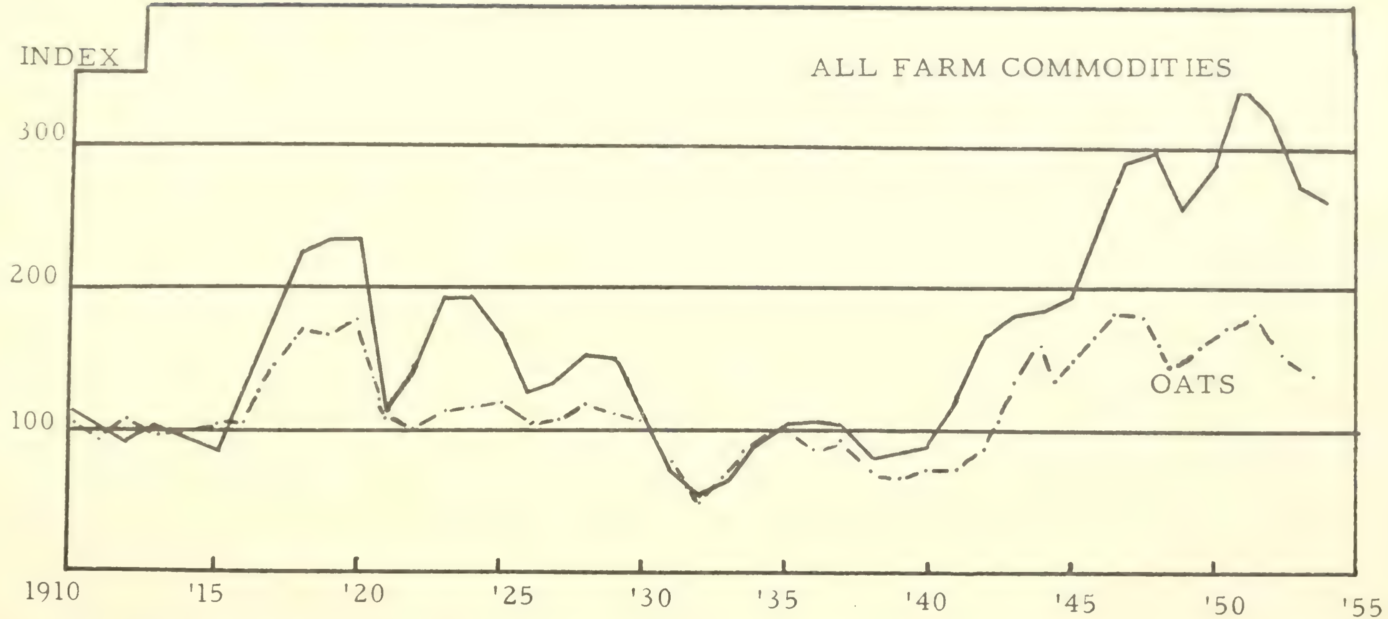

Figure 17. INDEX OF OAT PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

During the depression of the "thirties" and during the agricultural depression of 1920 were the only times for the 45-year period that oat prices have had their 1910-14 relationship to prices of all commodities. The balance of the time oat prices have been below their 1910-14 relationship to other farm prices. Price changes from one year to the next have generally been much less for oats than for the average of all farm commodities.

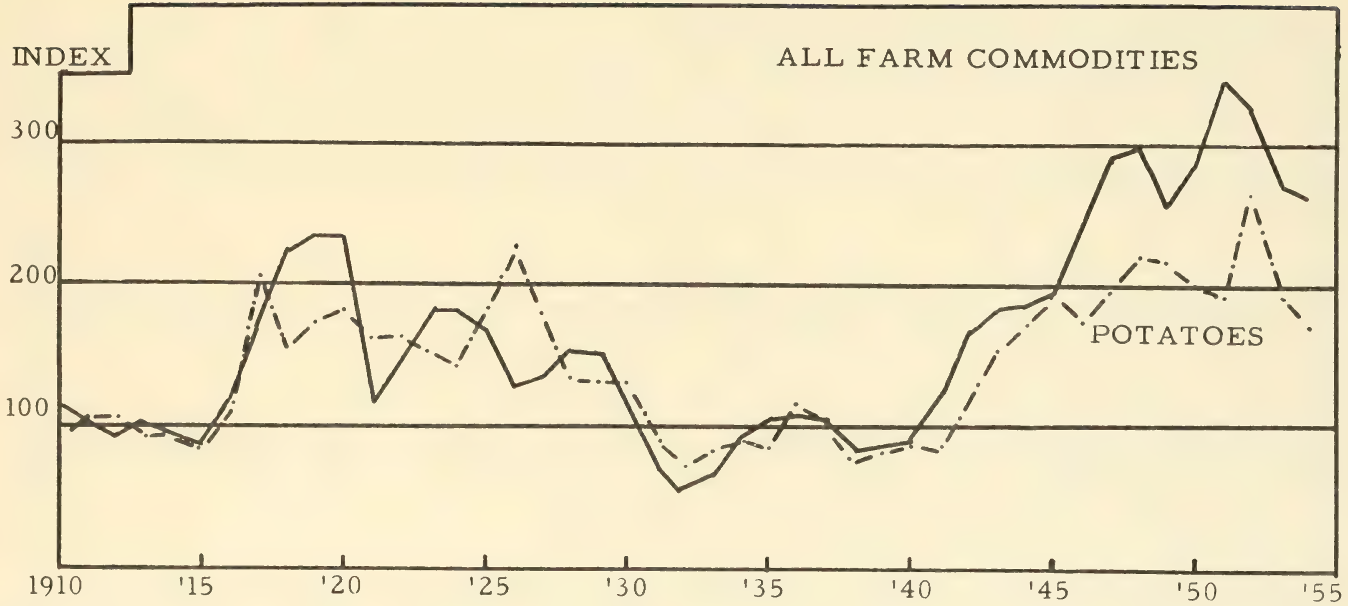

Figure 18. INDEX OF POTATO PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

From 1917 to 1930 potato prices failed to follow at all closely the general level of prices received by farmers. Since 1930, price changes have generally been in the same direction, but for the latter part of the period (since 1940) potato prices have become more and more unfavorable compared to the base period relationship.

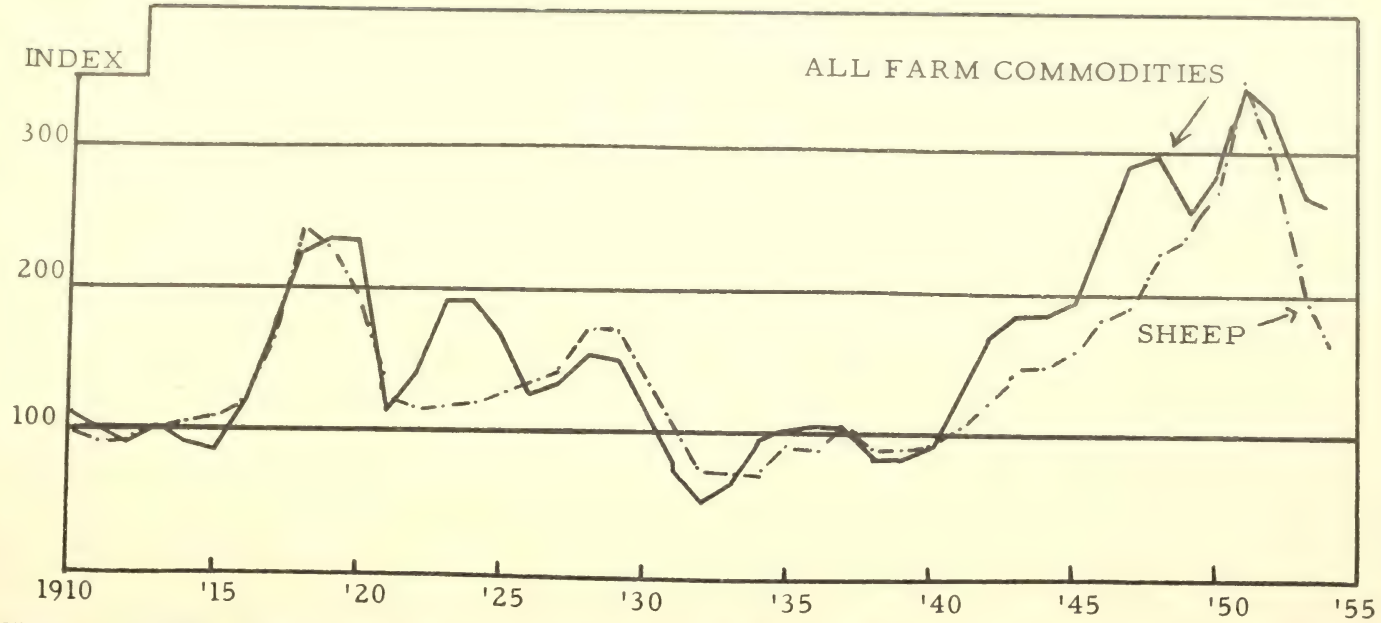

Figure 19. INDEX OF SHEEP PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Fluctuations in sheep prices have been of about the same extent as fluctuations in the prices of all farm commodities taken together. During World War II sheep prices rose slower than farm prices in general. However, they continued to rise when other farm prices fell in 1949. Sheep prices have fallen much faster than farm prices in general since both reached their peak in 1951.

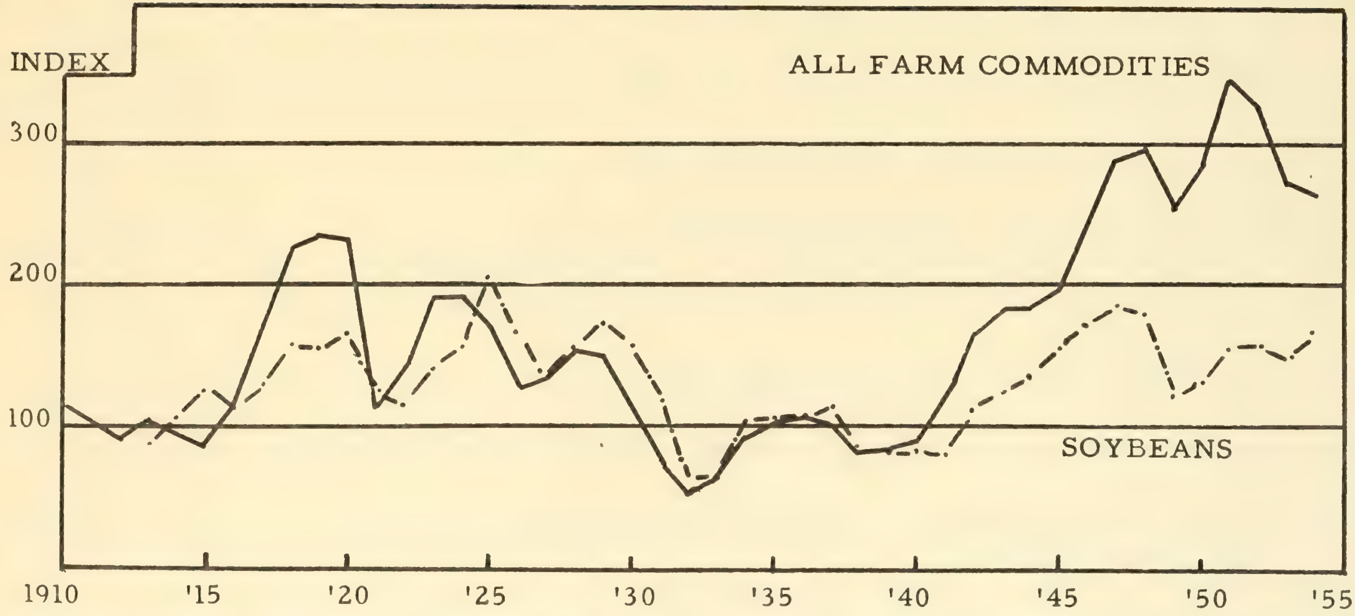

Figure 20. INDEX OF SOYBEAN PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1913-54. (1913 - 14 = 100)

Soybean prices have fluctuated much less during the 42-year period than farm prices in general. Price changes have usually been in the same direction, but the extent of the change has been less for soybeans. Since 1940, the price of soybeans has been unfavorable compared to the base period relationship.

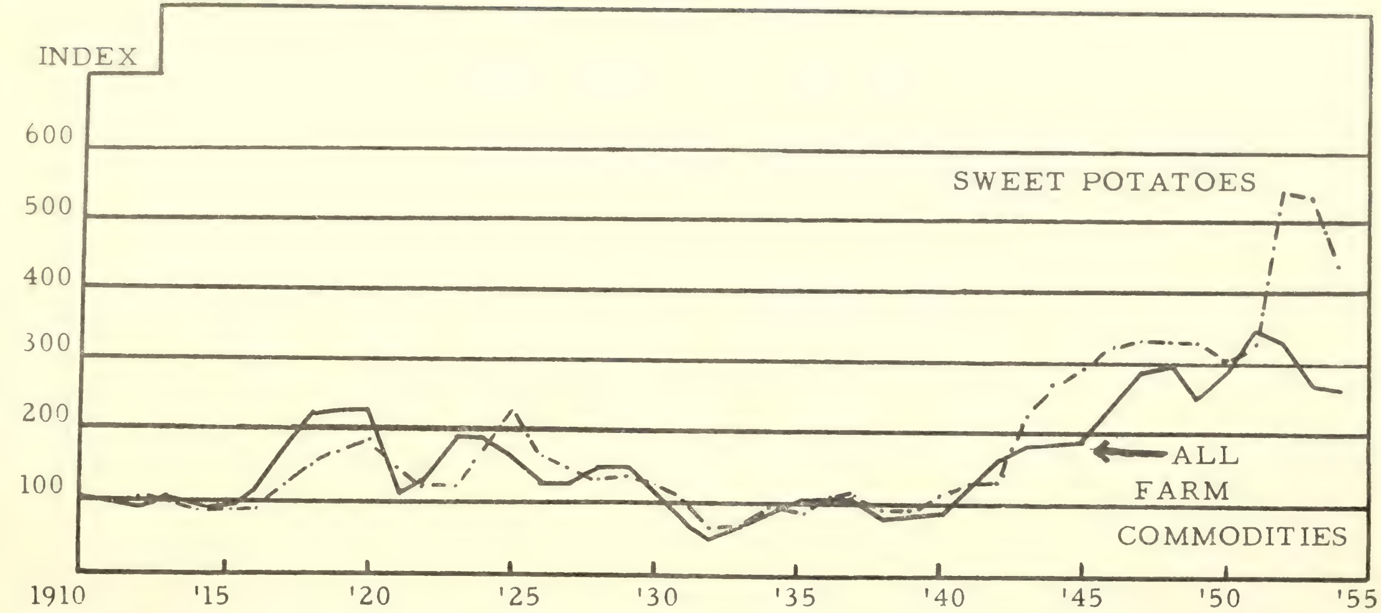

Figure 21. INDEX OF SWEET POTATO PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910 - 54, (1910-14 = 100)

Prices of sweet potatoes fluctuated more during the 45-year period than all farm commodities taken together.

In general the price of sweet potatoes has been high when the general level of farm prices was high and low when the general level of farm prices was low. Since 1942, compared to the base period relationship the level of sweet potato prices has been higher than the level of prices for all farm commodities taken together.

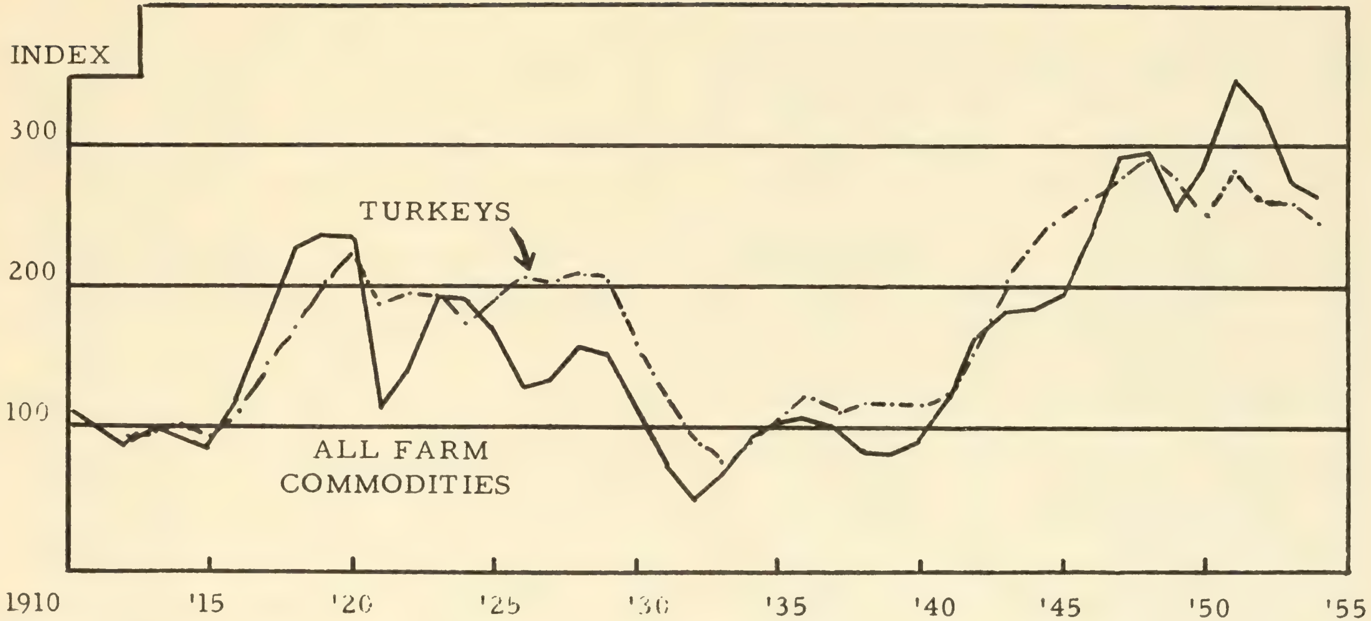

Figure 22. INDEX OF TURKEY PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1912-54. (1912 - 14 = 100)

Turkey prices were slightly more stable than the general level of all farm commodities during the 43-year period. Prices of turkeys have not followed too closely the general level of farm prices, but generally relatively high prices have been received when the index for all farm commodities was relatively high and vice versa.

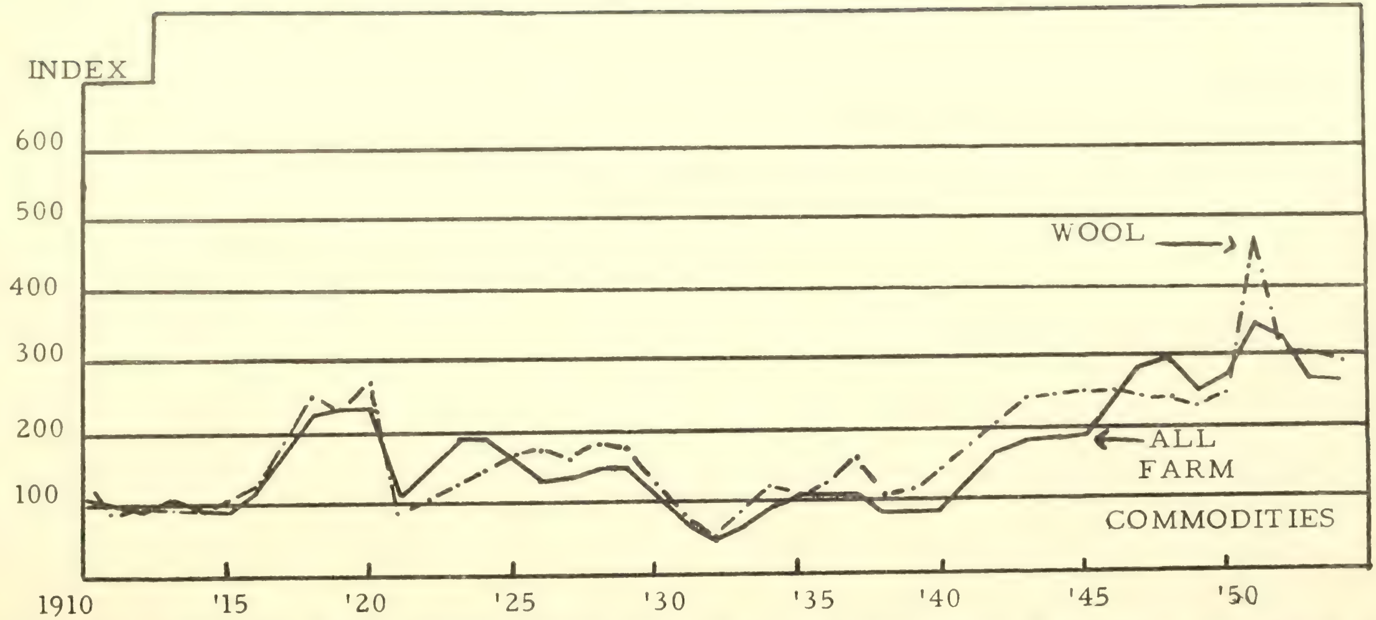

Figure 23. INDEX OF WOOL PRICES COMPARED WITH INDEX OF PRICES RECEIVED FOR ALL FARM COMMODITIES, MISSISSIPPI, 1910-54. (1910 - 14 = 100)

Wool prices were subject to about the same degree of variability during the 45-year period as the index of prices received for all farm commodities. During most of the period wool prices were relatively more favorable than during the base period.

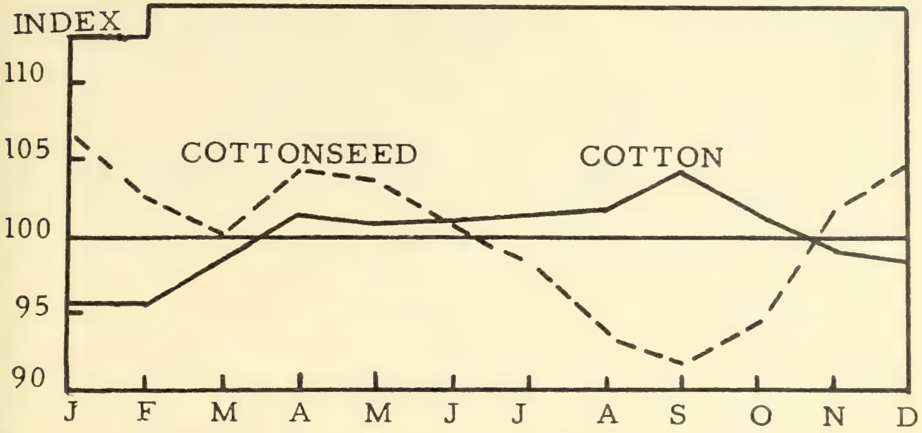

Figure 24. INDEX OF SEASONAL VARIATION IN PRICES OF COTTON AND COTTONSEED, MISSISSIPPI, 1946-54.

Cotton prices peaked in September and were lowest in January. The exact opposite was true of cottonseed prices. Cottonseed prices changed more, percentagewise, during the year than did cotton prices—16 percent from the low month to the high month compared to only 9 percent for cotton.

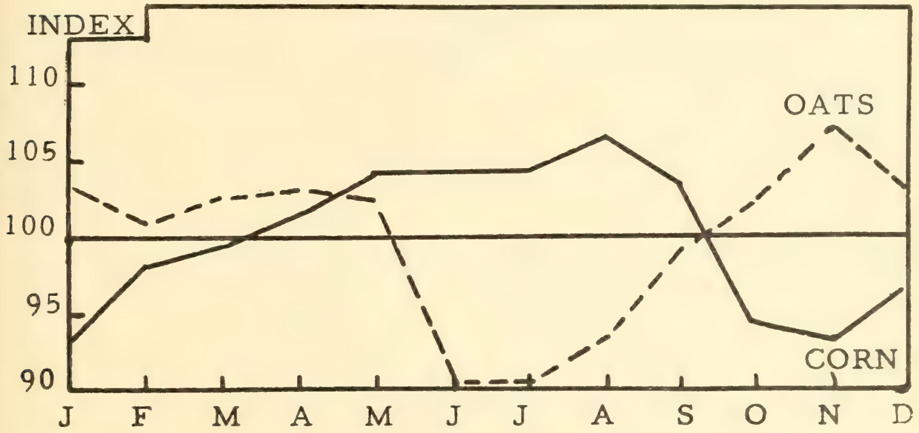

Figure 25. INDEX OF SEASONAL VARIATION IN PRICES OF OATS AND CORN, MISSISSIPPI, 1946-54.

Prices of corn and oats varied in opposite directions within the same year. When the price of one was higher than the average for the year the other was lower than the average. Oat prices usually reached their high for the year in November and the low for the year in June or July, shortly after harvest time. Corn prices usually reached a peak in August (just before harvest) and a low in November (just after harvest). Percentagewise, the change in prices from the low month to the high month was about the same for corn and oats—14 percent and 19 percent.

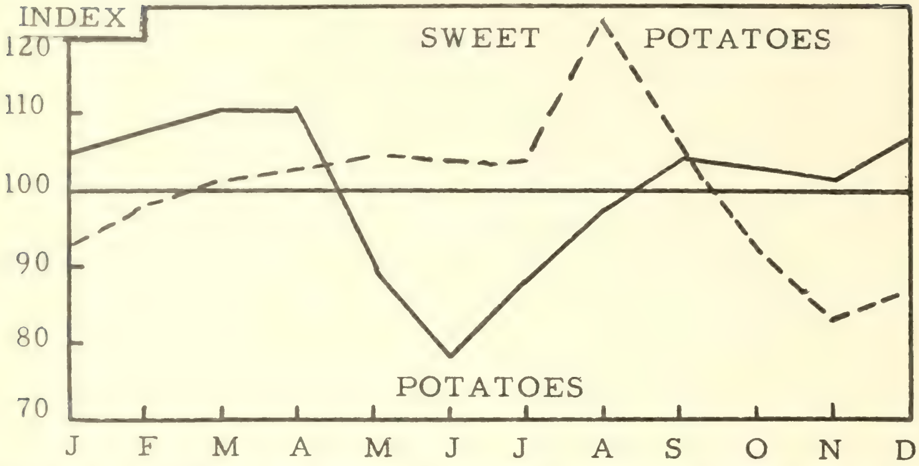

Figure 26. INDEX OF SEASONAL VARIATION IN PRICES OF SWEET POTATOES AND POTATOES, MISSISSIPPI, 1946-54.

Both sweet potato and potato prices usually varied considerably during the year. Sweet potato prices usually decreased about 32 percent from the high month (August, when the early ones begin hitting the market) to the low month (November, just after the bulk of the crop is harvested). Potato prices usually decreased by about 29 percent from March to June.

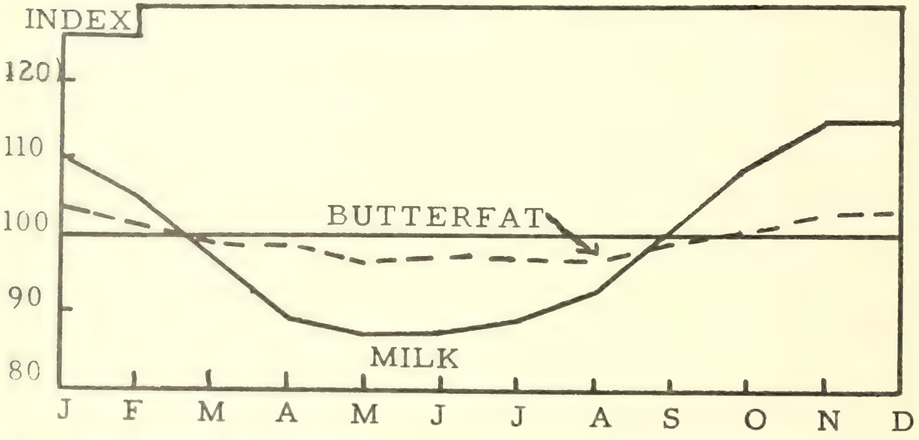

Figure 27. INDEX OF SEASONAL VARIATION IN PRICES OF MILK AND BUTTERFAT, MISSISSIPPI, 1946-54.

Butterfat prices were fairly stable within a given year compared to milk prices. The percentage change from the low month to the high month was only about 7 percent for butterfat compared to 32 percent for milk. Both butterfat and milk reached a seasonal low in May or June and a seasonal high in November or December.

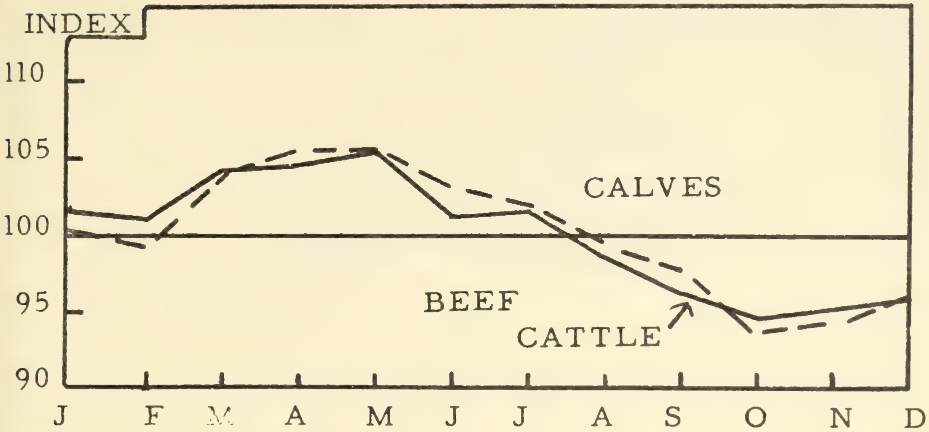

Figure 28. INDEX OF SEASONAL VARIATION IN PRICES OF CALVES AND BEEF CATTLE, MISSISSIPPI, 1946-54.

Prices of beef cattle and calves followed similar seasonal patterns. Both were highest in May, and lowest in October when marketings are heaviest. Beef cattle prices usualy decreased about 10 percent from May to October and prices of calves usually decreased by about 11 percent.

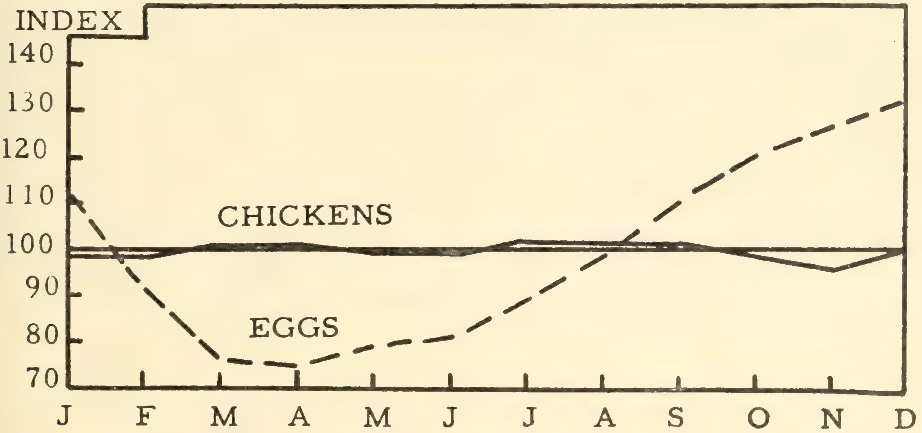

Figure 29. INDEX OF SEASONAL VARIATION IN PRICES OF CHICKENS AND EGGS, MISSISSIPPI, 1946-54.

Compared to the seasonal variation in egg prices, prices of chickens were relatively stable. Chicken prices usually increased by only 7 percent from the low month (November) to the high month (July). Egg prices generally increased by about 76 percent from the low month to the high month. Prices of eggs were usually lowest in March or April and highest in December.

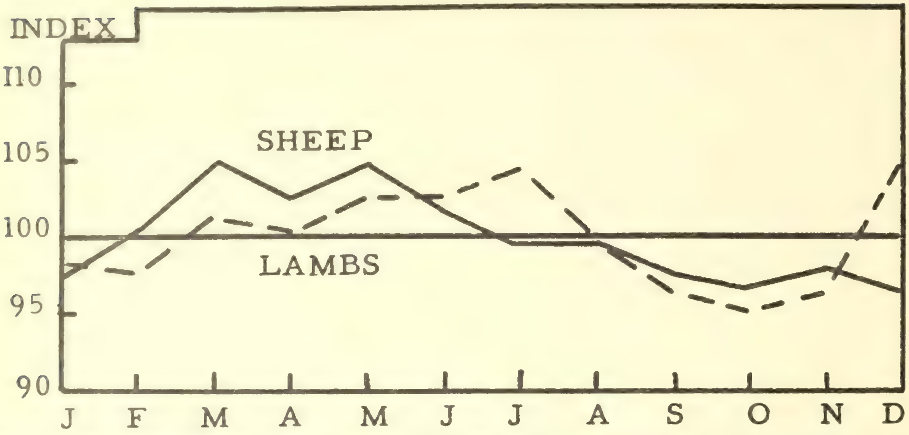

Figure 30. INDEX OF SEASONAL VARIATION IN PRICES OF SHEEP AND LAMBS, MISSISSIPPI, 1946-54.

Sheep prices were usually highest during March, April and May and lowest during October. The decline in prices from March to October was about 8 percent.

Lamb prices showed two seasonal highs, July and December. The seasonal low came at the same time as for sheep, October. Prices of lambs averaged about 10 percent higher in July and December than in October.

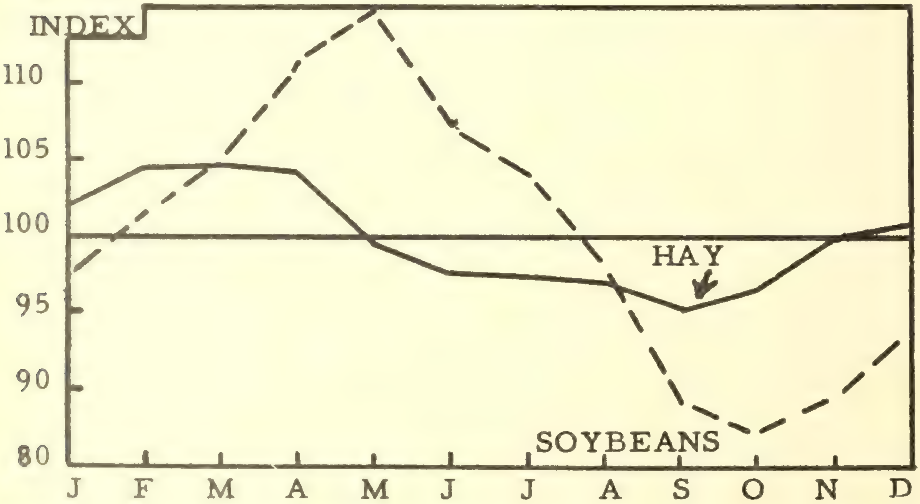

Figure 31. INDEX OF SEASONAL VARIATION IN PRICES OF HAY AND SOYBEANS, MISSISSIPPI, 1946-54.

Hay prices were usually at their seasonal high during February, March, and April and at their seasonal low during September. The usual decline in price was about 9 percent during this period.

Soybean prices were usually highest during May and lowest during October. The decline in soybean prices during this period averaged about 24 percent.

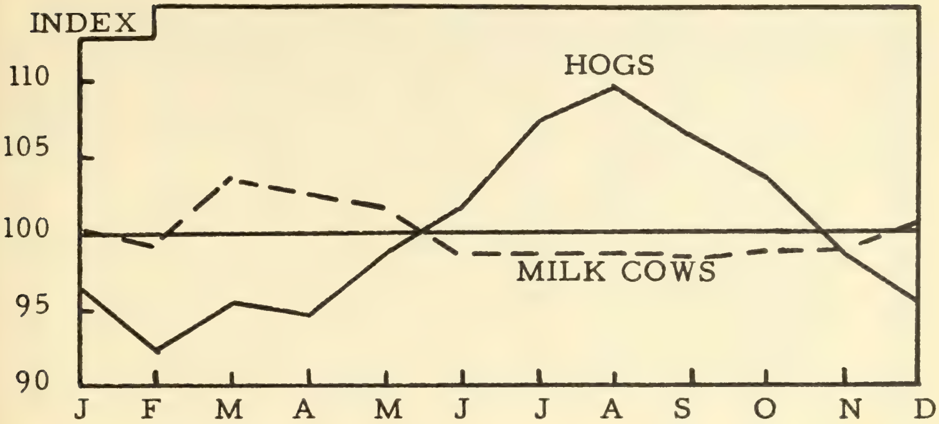

Figure 32. INDEX OF SEASONAL VARIATION IN PRICES OF HOGS AND MILK COWS, MISSISSIPPI, 1946-54.

Hog prices were usually lowest in February and highest in August, increasing by 18 percent during this period.

Milk cow prices were generally stable for the latter half of the year. Prices were usually highest in March. On the average, prices decline by only about 5 percent from March to September.

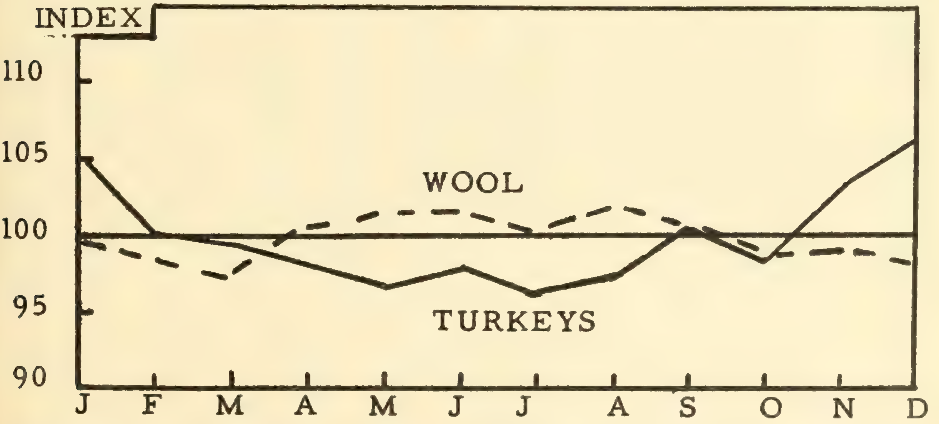

Figure 33. INDEX OF SEASONAL VARIATION IN WOOL AND TURKEY PRICES, MISSISSIPPI, 1946-54.

Wool prices were usually fairly stable during the year, increasing by only about 5 percent from the low month (March) to the high month (August).

Prices of turkeys reached a seasonal low in July and a seasonal high in December, increasing by about 10 percent during this period. Turkey prices were also relatively high during November and January.

Table 1. Index numbers of prices received by farmers, Mississippi, 1910 - March, 1955.

Year	(1910 - 14 = 100)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
1910-14	103	102	103	103	105	104	103	100	96	95	94	94	100
1915-19	154	150	150	154	159	162	167	172	177	190	196	196	169
1920-24	184	184	178	180	180	178	177	171	167	170	168	166	175
1925-29	146	144	144	147	148	149	149	148	158	152	142	139	147
1930-34	82	82	81	82	83	81	82	79	80	77	78	76	80
1935-39	96	96	96	97	96	96	97	94	94	94	93	94	95
1940	93	93	91	93	91	89	89	88	87	89	90	91	90
1941	92	93	94	100	108	117	127	135	160	152	149	152	124
1942	158	161	162	169	170	163	165	154	160	173	175	173	167
1943	175	176	179	182	183	184	185	185	187	186	179	180	182
1944	180	182	184	182	182	181	182	182	189	192	190	191	185
1945	192	187	187	187	190	191	195	194	199	207	210	211	196
1946	205	203	197	205	210	223	257	265	283	304	273	276	242
1947	272	275	288	290	285	287	298	292	285	289	300	318	290
1948	317	293	287	306	315	312	307	295	297	288	286	280	299
1949	266	256	251	265	264	260	257	256	262	258	254	245	258
1950	240	249	251	256	265	269	294	309	335	322	338	344	289
1951	357	362	369	371	368	359	346	312	316	326	348	353	348
1952	351	343	338	339	327	333	326	332	329	314	302	296	328
1953	288	282	282	276	277	266	268	266	268	266	261	262	272
1954	264	268	267	267	266	263	261	263	271	271	261	259	265
1955	264	267	266										

Prices received by farmers have on the average been higher than during the 1910-14 period since May 1941. The highest recorded for the entire period was during April 1951. At that time prices received by Mississippi farmers averaged 271 percent higher than during the base period 1910-14. See cover chart and Figure 2 for graphic presentations.

Table 2. Index numbers of prices received by farmers, United States, 1910 - March, 1955.

Year	(1910 - 14 = 100)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
1910-14	101	101	101	101	100	100	99	99	100	100	100	99	100
1915-19	152	152	154	160	163	162	164	167	169	173	175	176	164
1920-24	156	155	153	153	153	151	150	148	147	149	146	143	150
1925-29	148	148	148	147	148	147	148	147	149	148	148	147	148
1930-34	91	89	89	89	88	86	87	87	89	86	87	84	87
1935-39	108	109	109	109	106	105	107	106	108	107	106	107	107
1940	99	103	102	101	101	97	98	95	98	100	102	103	100
1941	106	106	107	114	115	120	126	129	139	137	137	142	123
1942	148	150	150	153	153	153	156	160	163	167	170	175	158
1943	181	184	191	195	193	193	191	191	192	195	195	198	192
1944	198	196	199	199	196	194	193	191	194	196	198	202	196
1945	204	202	204	207	204	209	209	207	202	206	211	213	206
1946	212	212	214	215	216	221	243	247	242	268	262	262	234
1947	256	260	278	274	267	267	273	272	285	285	287	301	275
1948	306	279	283	288	288	292	297	289	287	273	267	266	285
1949	265	255	258	256	253	249	246	244	247	242	237	233	249
1950	235	237	237	241	247	247	263	267	272	268	276	286	256
1951	300	313	311	309	305	301	294	292	291	296	301	305	301
1952	300	289	288	290	293	292	295	295	288	282	277	269	288
1953	268	264	264	259	263	257	260	255	257	249	249	254	258
1954	259	258	256	257	258	248	247	251	246	242	244	239	250
1955	244	245	244										

Prices received by farmers of the United States as a whole have averaged higher than during the 1910-14 base period since November 1940. The highest recorded for the entire period 1910 - March 1955 was for February 1951. At that time prices received by farmers averaged 213 percent higher than during the 1910-14 period. See Figures 1 and 2 for graphic presentations.

Table 3. Index numbers of prices paid by farmers, United States, 1910 - March, 1955.

Year	(1910 - 14 = 100)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
1910-14													100
1915-19													148
1920-24													168
1925-29			162			162			161			160	161
1930-34			126			124			125			122	124
1935-39			125			125			125			125	125
1940	124	124	125	125	125	123	123	123	123	123	123	124	124
1941	125	125	126	128	129	130	133	134	137	138	139	141	132
1942	143	145	147	149	150	151	152	153	154	156	158	159	152
1943	161	164	166	168	170	171	172	172	172	175	175	176	170
1944	178	179	180	181	182	182	182	183	183	183	184	184	182
1945	186	184	188	189	190	190	190	189	189	191	191	192	189
1946	193	195	196	197	199	202	210	213	212	219	224	223	207
1947	227	229	234	237	236	237	239	241	245	247	248	253	240
1948	261	257	257	260	261	262	262	260	259	257	257	256	259
1949	255	252	255	254	253	252	250	249	248	246	245	246	250
1950	248	248	250	250	253	254	256	257	260	261	263	265	255
1951	272	276	280	283	283	282	282	282	282	283	284	284	281
1952	287	288	288	289	289	287	286	287	286	284	282	281	286
1953	284	281	282	280	280	277	278	279	277	276	277	278	279
1954	282	282	283	283	284	282	280	282	280	279	279	279	281
1955	283	283	284										

Prices paid by farmers have averaged higher than during the 1910-14 period each year since that time, but in periods of relatively high prices have not risen as much as prices received by farmers. On the other hand, in periods of relatively low prices, prices paid by farmers have not fallen as much as prices received. Prices paid by farmers reached their highest peak for the 1910 - March 1955 period in April and May of 1952. At that time farmers paid, on the average, prices which were 189 percent above prices paid during the 1910-14 period. See cover chart and Figure 1 for graphic presentations.

Table 4. Parity ratios, Mississippi, 1910 - March, 1955.

Year	(1910 - 14 = 100)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
1910-14													100
1915-19													114
1920-24													104
1925-29			89			92			98			87	91
1930-34			64			65			64			62	65
1935-39			77			77			75			75	76
1940	75	75	73	74	73	72	72	72	71	72	73	73	73
1941	74	74	75	78	84	90	95	101	117	110	107	108	94
1942	110	111	110	113	113	108	109	101	104	111	111	109	110
1943	109	107	108	108	108	108	108	108	109	106	102	102	107
1944	101	102	102	101	100	99	100	99	103	105	103	104	102
1945	103	102	99	99	100	101	103	103	105	108	110	110	104
1946	106	104	101	104	106	110	122	124	133	139	122	124	117
1947	120	120	123	122	121	121	125	121	116	117	121	126	121
1948	121	114	112	118	121	119	117	113	115	112	111	109	115
1949	104	102	98	104	104	103	103	103	106	105	104	100	103
1950	97	100	100	102	105	106	115	120	129	123	129	130	113
1951	131	131	132	131	130	127	123	111	112	115	123	124	124
1952	122	119	117	117	113	116	114	116	115	111	107	105	115
1953	101	100	100	99	99	96	96	95	97	96	94	94	97
1954	94	95	94	95	94	93	93	93	97	97	94	93	94
1955	93	94	94										

The parity ratio for Mississippi farmers has generally been below 100 in periods of relatively low prices and above 100 in periods of relatively high prices. The years 1953 and 1954 have been exceptions. When the parity ratio is equal to 100, the purchasing power of farm commodities is, on the average, the same as during the designated base period. The highest parity ratio recorded for the 1910 - March 1955 period was 132 in March of 1951. See Figure 3 for graphic presentation.

Table 5. Parity ratios, United States, 1910 - March, 1955.

Year	(1910 - 14 = 100)												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
1910-14													100
1915-19													111
1920-24													89
1925-29			91			91			93			92	92
1930-34			71			69			71			69	70
1935-39			87			84			86			86	86
1940	80	83	82	81	81	79	80	77	80	81	83	83	81
1941	85	85	85	89	89	92	95	96	101	99	99	101	93
1942	103	103	102	103	102	101	103	105	106	107	108	110	104
1943	112	112	115	116	114	113	111	111	112	111	111	112	113
1944	111	109	111	110	108	107	106	104	106	107	108	110	108
1945	110	108	109	110	107	110	110	110	107	108	110	111	109
1946	110	109	109	109	109	109	116	116	114	122	117	117	113
1947	113	114	119	116	113	113	114	113	116	115	116	119	115
1948	117	109	110	111	110	111	113	111	111	106	104	104	110
1949	104	101	101	101	100	99	98	98	100	98	96	95	100
1950	95	96	95	96	98	97	103	104	105	103	105	108	100
1951	110	113	111	109	108	107	104	104	103	105	106	107	107
1952	105	100	100	100	101	102	103	103	101	99	98	96	101
1953	94	94	94	92	94	93	94	91	93	90	90	91	92
1954	92	91	90	91	91	88	88	89	88	87	87	86	89
1955	86	87	86										

The parity ratio for the United States reached its highest level for the 1910-March, 1955 period on March 1947 and again in December of the same year. During these two months, a given amount of farm commodities would buy, on the average, 19 percent more than the same amount would have bought during the 1910-14 base period. See Figure 3 for graphic presentation.

Table 6. Index of purchasing power of farm commodities, Mississippi, 1910-54.

Year	(1910 - 14 = 100)										
	Cotton	Cotton-seed	Corn	Oats	Hay	Soy-beans	Pota-toes	Sweet potatoes	Milk	Butter-fat	Milk cows
1910-14	100	100	100	100	100	100	100	100	100	100	100
1915-19	112	149	108	94	83	96	100	86	88	95	109
1920-24	116	102	83	73	78	85	106	94	88	112	72
1925-29	95	95	83	69	73	104	106	106	72	109	87
1930-34	62	67	69	64	65	81	76	75	57	71	66
1935-39	70	105	79	68	65	79	75	81	65	94	76
1940	65	89	77	57	56	68	71	92	65	91	90
1941	88	121	68	55	57	62	64	95	73	105	104
1942	105	142	70	59	57	76	79	86	77	112	117
1943	99	131	93	78	76	75	89	133	83	120	136
1944	96	130	106	88	96	75	94	151	82	112	114
1945	97	122	97	72	92	83	102	157	79	108	114
1946	114	130	108	77	88	83	85	155	93	117	123
1947	115	162	109	76	78	79	83	140	90	123	122
1948	105	143	96	70	77	70	85	127	90	119	143
1949	98	88	63	58	76	50	87	131	78	99	162
1950	111	104	69	63	75	52	78	118	77	92	176
1951	120	131	69	61	78	56	69	116	80	90	192
1952	112	107	84	63	86	55	94	193	84	93	188
1953	98	99	80	55	108	53	70	193	77	87	128
1954	100	93	70	50	73	57	61	156	69	79	101

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Table 6—(Continued). Index of purchasing power of farm commodities, Mississippi, 1910-54.

Year	(1910 - 14 = 100)								
	Beef cattle	Calves	Hogs	Chickens	Eggs	Turkeys	Sheep	Lambs	Wool
1910-14	100	100	100	100	100	100	100	100	100
1915-19	103	105	105	95	99	98	115	126	118
1920-24	58	68	72	105	95	119	80	94	75
1925-29	77	88	86	112	95	128	94	121	108
1930-34	63	71	60	86	73	87	74	95	77
1935-39	89	95	83	95	88	93	75	97	100
1940	110	117	58	89	84	93	76	98	116
1941	130	134	88	98	95	95	81	120	139
1942	149	151	114	103	101	103	80	149	143
1943	150	151	113	122	115	120	87	156	144
1944	128	130	88	116	103	127	82	142	137
1945	139	138	104	124	115	132	84	138	135
1946	150	143	118	114	113	126	87	123	124
1947	155	156	137	104	110	115	81	128	102
1948	186	182	129	102	103	113	89	142	94
1949	184	183	108	98	99	111	98	164	93
1950	200	197	105	85	85	100	107	173	100
1951	232	227	107	85	94	101	125	195	166
1952	202	197	94	76	84	92	107	188	105
1953	111	125	111	79	92	94	75	157	108
1954	93	104	117	67	79	88	58	149	105

The index of purchasing power at any given time indicates the percentage of the purchasing power that the commodity had during the 1910-14 period that it had at the specified time. For example, in 1954 a bushel of oats would buy only one-half as much of the things farmers usually buy as one bushel would have bought during the base period 1910-14. On the other hand, a bushel of sweet potatoes would have bought 56 percent more during 1954 than during the 1910-14 base period.

Table 7. Relative prices received by farmers, Mississippi, 1910-54.

Year	(1910 - 14 = 100)									
	Cotton	Cotton-seed	Corn	Oats	Hay	Soy-beans	Pota-toes	Sweet potatoes	Milk	Butter-fat
1910-14	100	100	100	100	100	100	100	100	100	100
1915-19	173	224	162	138	122	138	148	129	131	143
1920-24	196	171	142	124	131	186	181	156	149	187
1925-29	152	153	133	111	118	167	171	170	116	174
1930-34	78	84	88	81	82	103	95	95	72	91
1935-39	87	131	99	86	82	99	94	101	81	117
1940	81	110	95	71	70	84	88	114	81	113
1941	116	160	90	73	75	82	84	126	96	139
1942	160	216	107	89	87	115	120	131	117	170
1943	168	222	158	132	129	127	152	226	141	204
1944	174	236	193	160	175	137	171	275	149	204
1945	183	230	183	137	173	156	193	297	150	204
1946	235	269	223	159	183	171	176	321	192	243
1947	275	389	262	183	186	189	198	335	216	296
1948	273	370	249	181	200	181	221	329	234	309
1949	245	221	157	146	191	124	217	327	194	248
1950	284	264	177	160	190	133	200	300	196	235
1951	336	368	193	171	219	158	195	327	224	252
1952	320	307	240	181	246	158	269	551	241	265
1953	274	277	222	154	221	149	195	533	216	243
1954	280	261	196	140	204	160	171	438	195	222

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Table 7—(Continued). **Relative prices received by farmers, Mississippi, 1910-54.**

Year	(1910 - 14 = 100)								
	Beef cattle	Calves	Hogs	Chickens	Eggs	Turkeys	Sheep	Lambs	Wool
1910-14	100	100	100	100	100	100	100	100	100
1915-19	152	154	160	142	149	146	174	188	178
1920-24	98	115	122	177	161	197	136	158	128
1925-29	124	141	138	180	153	206	150	194	172
1930-34	80	91	76	108	93	177	93	119	94
1935-39	111	119	105	118	111	117	94	122	128
1940	137	145	72	110	104	115	94	122	144
1941	172	177	116	129	126	126	107	159	183
1942	227	230	173	157	154	156	121	227	217
1943	255	257	192	207	195	204	148	265	244
1944	233	237	160	212	188	231	149	259	250
1945	263	260	196	235	217	250	158	261	256
1946	310	296	244	237	234	261	181	255	256
1947	371	374	329	250	265	276	194	306	244
1948	481	471	334	263	268	293	230	368	244
1949	461	457	271	245	247	278	244	411	233
1950	509	503	269	216	216	254	272	442	256
1951	651	637	300	238	264	283	351	548	467
1952	579	564	269	217	241	262	305	537	300
1953	311	349	309	220	256	261	208	437	300
1954	261	291	328	187	221	247	162	420	294

Price relatives are a means whereby price changes from same base period may be compared for several different commodities. For example, in 1954, oat prices were only 40 percent higher than during the 1910-14 period while lamb prices were 320 percent higher. For comparisons of price relatives of individual commodities with the index of prices received for all commodties, see Figures 4-23.

Table 8. Beef cattle: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
	Dollars per cwt.												
1910-14	3.46	3.48	3.68	3.70	3.98	3.80	3.64	3.68	3.66	3.72	3.62	3.44	3.66
1915-19	5.12	5.18	5.38	5.66	5.98	5.88	6.00	5.68	5.62	5.42	5.24	5.38	5.55
1920-24	3.70	3.80	3.98	3.96	3.88	3.70	3.62	3.52	3.40	3.34	3.16	3.10	3.60
1925-29	4.12	4.34	4.26	4.48	4.74	4.72	4.54	4.62	4.66	4.82	4.72	4.60	4.55
1930-34	3.13	3.19	3.29	3.33	3.35	3.20	2.85	2.70	2.66	2.63	2.52	2.47	2.94
1935-39	3.67	3.79	3.94	4.13	4.18	4.18	4.15	4.08	4.21	4.11	4.09	4.03	4.05
1940	4.80	4.80	5.10	5.40	5.30	5.20	5.00	4.90	4.95	4.90	4.80	4.80	5.00
1941	5.10	5.60	5.60	6.00	6.20	6.30	6.70	6.70	7.00	6.90	6.70	6.70	6.29
1942	7.30	7.70	8.00	8.50	8.60	8.40	8.30	8.30	8.30	8.50	8.80	8.80	8.29
1943	9.20	9.80	10.00	10.20	10.50	10.30	10.20	9.50	8.60	7.90	7.50	8.40	9.34
1944	8.30	9.00	10.00	9.80	9.50	8.80	8.10	8.00	7.70	7.40	7.50	8.10	8.52
1945	8.60	9.10	9.70	10.20	10.20	10.00	10.00	9.60	9.50	9.50	9.50	9.60	9.62
1946	9.60	10.00	10.40	11.00	11.20	11.20	13.00	12.40	11.40	12.00	12.40	11.70	11.36
1947	11.70	12.40	13.90	13.70	13.10	13.70	13.70	13.70	13.50	14.20	14.40	14.90	13.57
1948	16.30	15.60	15.60	17.10	18.20	18.50	19.00	19.20	19.20	17.50	17.80	17.20	17.60
1949	17.50	17.00	18.00	18.10	18.00	17.80	17.10	16.10	16.10	15.30	15.50	16.00	16.88
1950	15.70	17.00	17.10	17.20	18.20	18.60	19.70	20.50	20.00	19.30	19.80	20.50	18.63
1951	22.50	23.60	25.40	25.40	24.70	23.30	24.00	23.40	23.40	24.00	23.00	23.40	23.84
1952	24.20	24.50	23 90	24.30	23.70	23.70	21.20	20.80	18.40	16.60	16.40	16.50	21.18
1953	16.50	15.00	14.50	13.50	13.00	9.50	10.20	10.00	8.70	8.40	8.40	9.00	11.39
1954	10.00	10.40	11.20	10.90	10.20	9.60	8.90	8.90	8.60	9.20	8.20	8.50	9.55
1955	9.60	10.10	10.30										

Beef cattle prices reached their peak for the 1910 - March 1955 period in March and April of 1951. The average price received by farmers at this time was $25.40 per cwt. For the entire year of 1951 beef cattle prices averaged $23.84 per cwt. The lowest average price for the period was $1.90 per cwt. in December 1932 and January 1933. The higher price is almost thirteen times as high as the lower prices. For year-to-year price changes see Table 30. For seasonal price movements see Tables 51 and 52 and Figure 28.

Table 9. Broilers, commercial: Average prices received by farmers, Mississippi, May 1952-April 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Cents per pound							
1952					24.0	27.0	30.0	30.0	30.0	29.0	31.0	29.0	28.8
1953	27.0	27.0	27.5	27.5	27.5	26.5	27.5	27.0	27.0	28.0	26.0	25.0	27.0
1954	24.5	23.0	23.0	23.5	23.0	23.0	25.0	25.5	23.0	21.5	19.5	18.0	22.7
1955	22.0	23.5	29.5	28.0									

Prices received by farmers for commercial broilers have been reported separately from other chickens only since May, 1952. From that time through March 1955, broiler prices ranged from an average of 18 cents per pound in December 1954 to an average of 31 cents per pound in November 1952.

Table 10. Butterfat: Average prices received by farmers, Mississippi, 1910 - March 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Cents per pound							
1910-14	24	23	22	22	22	22	22	22	22	23	23	24	23
1915-19	34	32	32	31	31	30	30	30	32	34	37	40	33
1920-24	51	49	49	47	40	37	38	38	40	41	44	46	43
1925-29	41	42	43	42	40	38	38	37	39	40	41	42	40
1930-34	21	21	21	22	20	19	19	20	21	22	22	21	21
1935-39	29	29	28	28	26	25	25	26	26	27	28	29	27
1940	27	27	26	25	25	24	24	24	25	25	26	29	26
1941	28	28	27	29	30	32	33	33	35	35	37	38	32
1942	36	38	38	39	36	34	35	37	41	44	44	44	39
1943	45	48	46	47	48	48	48	48	48	48	48	47	47
1944	47	47	47	46	46	46	46	45	46	47	48	49	47
1945	48	47	47	46	46	45	45	46	47	47	47	48	47
1946	48	48	48	48	48	48	55	57	59	65	80	74	56
1947	70	63	65	65	62	61	62	66	74	71	76	80	68
1948	79	76	73	73	70	71	72	71	69	65	64	65	71
1949	65	60	60	60	59	57	54	54	54	54	55	55	57
1950	54	54	53	52	51	50	52	54	54	56	57	57	54
1951	58	58	57	57	59	58	58	58	58	58	60	62	58
1952	63	64	62	60	60	60	61	60	61	61	61	61	61
1953	59	57	56	54	54	54	54	53	55	56	57	57	56
1954	55	54	52	48	48	49	49	51	51	53	54	53	51
1955	50	52	51										

Prices received by farmers for butterfat reached an average of 80 cents per pound in November 1946 and again in December 1947. The lowest average price recorded for the 1910 - March 1955 period was 11 cents per pound in July 1932. Percentagewise, the change in prices from the lowest to the highest for the 45-year period was 627 percent. For year-to-year price changes see Table 31. For seasonal price movements see Tables 51 and 52 and Figure 27.

Table 11. Calves: Average prices received by farmers, Mississippi, 1910 - March 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per cwt.							
1910-14	4.52	4.74	5.00	4.60	4.74	4.64	4.70	4.76	4.84	4.74	4.58	4.54	4.70
1915-19	6.74	6.82	6.92	7.30	7.82	7.48	7.86	7.16	7.08	7.28	6.98	7.22	7.22
1920-24	5.56	5.66	6.04	6.04	5.80	5.40	5.44	5.14	5.00	5.20	4.88	4.66	5.40
1925-29	6.10	6.30	6.52	6.66	6 80	6.74	6.64	6.84	7.06	6.96	6.70	6.50	6.65
1930-34	4.75	4.62	4.53	4.67	4.71	4.54	4.23	4.00	3.82	3.90	3.75	3.54	4.26
1935-39	5.12	5.28	5.57	5.66	5.77	5.71	5.68	5.62	5.82	5.76	5.58	5.60	5.60
1940	6.60	6.60	6.80	7.00	7.10	7.00	6.80	6.60	6.70	6.90	6.80	6.90	6.82
1941	7.20	7.50	7.50	7.70	8.30	8.30	8.80	8.80	9.30	9.10	8.70	8.80	8.33
1942	10.00	10.20	10.30	10.90	10.90	10.80	11.00	11.00	10.90	11.00	11.00	11.50	10.79
1943	11.60	12.10	12.50	12.80	13.10	12.70	12.70	12.30	12.20	11.50	10.60	10.60	12.06
1944	10.50	11.00	11.50	11.60	11.40	11.40	10.80	11.10	11.20	11.20	10.90	11.30	11.16
1945	11.40	11.70	12.10	12.50	12.50	12.50	12.70	12.50	12.00	12.20	12.20	12.20	12.21
1946	12.60	13.00	13.40	13.60	13.60	14.00	15.20	15.00	13.80	14.20	14.50	14.30	13.93
1947	14.80	15.20	17.70	17.50	17.30	18.30	18.10	17.50	18.20	18.40	18.90	19.00	17.57
1948	20.90	19.50	19.90	21.00	22.00	22.50	25.00	24.70	24.40	21.80	22.50	21.60	22.15
1949	22.70	21.80	22.50	23.00	22.80	22.60	21.60	20.40	20.70	19.20	19.70	20.50	21.46
1950	20.80	21.50	22.00	22.00	23.40	23.60	24.80	25.10	25.90	23.80	25.00	25.50	23.62
1951	27.30	29.70	31.20	31.50	31.20	30.40	30.80	29.80	29.70	30.50	28.50	28.90	29.96
1952	30.00	30.70	30.70	30.00	29.80	28.50	26.50	25.20	23.10	21.20	20.90	21.30	26.49
1953	20.70	19.40	19.00	18.50	18 50	15.40	16.10	15.40	13.50	12.80	13.30	14.00	16.38
1954	15.00	15.30	15.50	15.50	15.50	14.30	13.00	12.50	12.50	12.30	11.10	11.90	13.70
1955	14.00	14.50	15.00										

The average price received for calves ranged from a low of $2.75 per cwt. in December 1932 to a high of $31.50 per cwt. in April 1951. The latter price is almost eleven and one-half times as great as the former. For year-to-year price changes see Table 32. For seasonal price movements see Tables 51 and 52 and Figure 28.

Table 12. **Chickens: Average price received by farmers, Mississippi, 1910 - March, 1955.**

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Cents per pound						
1910-14	11.7	11.7	11.6	11.7	11.9	12.2	12.3	12.1	12.2	12.5	12.2	11.8	12.0
1915-19	14.8	15.2	15.6	16.8	17.2	18.7	18.3	17.1	17.9	18.2	17.8	17.5	17.1
1920-24	19.4	20.1	20.5	21.3	22.7	23.8	22.9	20.8	21.4	21.8	20.5	19.3	21.2
1925-29	20.0	20.3	20.9	22.1	23.9	24.0	22.3	21.2	21.5	22.0	21.3	20.3	21.6
1930-34	12.7	13.0	13.0	13.7	14.1	14.1	13.3	12.3	12.5	12.8	12.6	11.9	13.0
1935-39	13.1	13.3	13.8	14.4	14.9	15.2	14.7	13.8	14.5	14.7	14.4	13.7	14.2
1940	12.3	12.3	12.6	13.1	13.6	14.0	14.0	13.4	13.5	13.5	13.3	12.8	13.2
1941	13.2	13.1	13.6	14.7	15.9	16.2	16.4	16.4	16.6	16.7	16.4	16.6	15.5
1942	16.6	17.2	17.4	17.7	19.0	19.4	19.2	19.1	19.3	20.1	20.2	20.2	18.8
1943	20.1	20.8	22.2	24.9	26.9	27.0	27.0	26.9	26.9	25.6	24.7	25.3	24.9
1944	25.4	24.6	24.8	24.8	26.0	26.2	26.3	26.5	26.0	25.1	25.1	25.1	25.5
1945	25.1	25.4	26.3	27.3	29.0	30.0	30.7	30.3	29.6	29.1	28.3	27.4	28.2
1946	26.8	27.1	26.1	26.5	28.0	29.0	31.0	30.8	30.0	30.0	28.0	28.0	28.4
1947	26.5	27.0	29.0	30.0	31.0	32.0	33.0	31.0	31.0	30.0	29.0	30.0	30.0
1948	30.0	30.0	29.0	31.3	33.2	32.6	33.7	32.0	32.0	32.5	30.5	32.3	31.6
1949	32.1	30.4	30.8	32.2	30.8	28.8	28.5	28.5	27.0	27.0	29.7	26.5	29.4
1950	23.5	23.6	26.7	26.9	25.9	25.2	26.2	28.2	28.5	26.1	25.0	24.5	25.9
1951	27.4	28.6	30.5	29.2	27.8	29.4	29.4	30.2	29.5	26.9	26.8	27.8	28.6
1952	29.2	28.9	27.4	25.0	24.1	25.0	24.5	23.5	24.5	24.0	28.9	27.7	26.1
1953	26.3	26.2	27.1	27.1	26.9	26.1	27.0	26.6	26.5	27.3	25.3	24.7	26.4
1954	24.3	23.0	22.5	23.4	22.8	22.7	24.6	25.1	22.6	20.0	19.6	17.9	22.4
1955	21.8	23.1	28.6										

Prices of chickens reached their highest point for the period 1910 - March 1955 in July 1948 and their lowest point in March 1933. The highest average price was 33.7 cents per pound compared to the lowest price, 7.9 cents per pound. From the lowest price to the highest price represents an increase of 327 percent. For year-to-year price changes see Table 33. For seasonal price movements see Tables 51 and 52 and Figure 29.

Table 13. **Corn: Average prices received by farmers, Mississippi, 1910 - March, 1955.**

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Dollars per bu.						
1910-14	.75	.77	.79	.81	.86	.88	.88	.88	.84	.79	.73	.72	.81
1915-19	1.08	1.14	1.23	1.32	1.40	1.44	1.50	1.51	1.39	1.26	1.22	1.23	1.31
1920-24	1.06	1.10	1.16	1.22	1.26	1.29	1.32	1.29	1.17	1.06	.96	.95	1.15
1925-29	1.04	1.08	1.09	1.12	1.15	1.16	1.17	1.15	1.11	1.03	.96	.94	1.08
1930-34	.64	.66	.69	.72	.74	.78	.80	.80	.74	.68	.62	.61	.71
1935-39	.72	.74	.78	.82	.85	.88	.91	.89	.87	.79	.69	.67	.80
1940	.69	.73	.77	.81	.85	.86	.88	.85	.79	.69	.65	.64	.77
1941	.66	.68	.72	.75	.76	.78	.78	.78	.76	.72	.67	.68	.73
1942	.72	.75	.82	.86	.89	.91	.92	.91	.91	.92	.89	.91	.87
1943	.95	1.00	1.05	1.20	1.25	1.28	1.38	1.46	1.48	1.45	1.42	1.42	1.28
1944	1.46	1.49	1.52	1.53	1.60	1.63	1.63	1.66	1.64	1.58	1.52	1.52	1.56
1945	1.54	1.52	1.54	1.55	1.55	1.55	1.53	1.50	1.45	1.37	1.36	1.35	1.48
1946	1.35	1.39	1.44	1.49	1.59	1.92	2.40	2.45	2.10	1.92	1.86	1.83	1.81
1947	1.77	1.77	1.85	2.00	2.00	2.05	2.27	2.37	2.50	2.36	2.23	2.26	2.12
1948	2.32	2.25	2.25	2.29	2.30	2.27	2.24	2.13	1.92	1.63	1.33	1.28	2.02
1949	1.29	1.26	1.32	1.32	1.35	1.34	1.32	1.30	1.27	1.18	1.17	1.13	1.27
1950	1.16	1.20	1.26	1.41	1.52	1.58	1.73	1.73	1.67	1.40	1.24	1.25	1.43
1951	1.35	1.46	1.54	1.54	1.59	1.59	1.61	1.59	1.57	1.54	1.63	1.68	1.56
1952	1.81	1.87	1.89	1.97	1.99	2.01	1.96	2.01	1.97	1.95	1.88	1.91	1.94
1953	1.91	1.93	1.90	1.90	1.90	1.92	1.93	1.86	1.76	1.59	1.48	1.52	1.80
1954	1.59	1.60	1.60	1.62	1.64	1.63	1.59	1.58	1.58	1.58	1.52	1.51	1.59
1955	1.51	1.59	1.54										

During the period 1910 - March 1955 corn prices ranged from an average of 34 cents per bushel to an average of $2.50 per bushel. The lowest price was for December 1932 and the highest was for September 1947. The change from the lowest to the highest amounted to 635 percent. For year-to-year price changes see Table 34. For seasonal price movements see Tables 51 and 52 and Figure 25.

Table 14. Cotton: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Cents per pound						
1910-14	12.5	12.5	12.5	12.7	12.9	12.9	12.8	12.2	11.5	11.1	10.9	10.9	12.1
1915-19	18.4	17.8	17.9	18.4	19.0	19.8	20.6	21.5	22.5	24.2	25.2	24.9	20.9
1920-24	24.9	25.0	23.9	24.4	24.4	24.3	24.2	23.3	22.8	23.1	22.5	22.2	23.7
1925-29	18.3	18.0	18.1	18.5	18.5	18.7	18.9	18.7	20.5	19.0	17.3	16.7	18.4
1930-34	9.5	9.7	9.7	9.8	9.8	9.5	9.9	9.4	9.4	9.0	9.0	8.6	9.4
1935-39	10.6	10.6	10.7	10.8	10.7	10.6	11.0	10.5	10.3	10.2	10.1	10.2	10.5
1940	10.2	10.2	10.1	10.2	9.8	9.7	9.5	9.5	9.5	9.7	9.8	9.6	9.8
1941	9.8	9.8	10.1	10.8	12.0	13.2	14.5	15.9	19.3	17.5	17.1	17.5	14.0
1942	18.6	19.0	19.0	19.9	20.0	19.0	19.5	19.0	19.6	20.0	20.0	19.5	19.4
1943	19.8	19.9	20.3	20.3	20.3	20.7	20.7	20.6	21.0	21.0	20.0	19.5	20.3
1944	19.9	20.3	20.4	20.5	20.4	20.7	21.1	20.9	22.1	22.8	22.0	21.8	21.1
1945	21.8	21.0	21.1	20.8	21.2	21.3	21.8	21.6	22.6	24.0	24.5	24.5	22.2
1946	23.5	23.5	22.7	23.8	24.2	26.0	30.4	31.8	36.0	38.2	29.8	30.8	28.4
1947	30.8	31.5	32.9	33.3	33.7	34.2	35.8	34.5	32.4	31.5	33.5	36.0	33.3
1948	35.2	32.2	32.2	35.0	36.0	34.5	33.0	31.6	32.3	32.0	31.4	30.4	33.0
1949	28.6	28.5	27.6	30.5	30.4	30.0	30.0	29.9	31.0	30.6	29.5	28.0	29.6
1950	28.0	29.3	29.6	30.5	31.3	32.0	35.2	36.9	40.8	38.9	40.4	40.4	34.4
1951	42.2	42.5	43.2	43.8	43.7	42.8	41.0	35.0	35.2	36.5	41.0	41.8	40.7
1952	41.2	40.1	40.1	40.5	38.2	39.3	39.1	39.9	40.1	37.6	34.9	33.8	38.7
1953	32.3	32.4	33.2	32.7	33.0	33.0	33.2	33.2	34.3	33.7	33.0	32.7	33.1
1954	32.5	33.4	33.4	33.5	33.5	33.8	33.9	34.5	35.7	35.3	33.7	33.1	33.9
1955	33.8	34.3	34.1										

For the period 1910 - March 1955 the average price received for cotton ranged from 4.8 cents per pound in June 1932 to 36.0 cents per pound in May 1948. The higher price is almost eight times as great as the lower price. For year-to-year price changes see Table 35. For seasonal price movements see Tables 51 and 52 and Figure 24.

Table 15. Cottonseed: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Dollars per ton						
1910-14	23.90	23.92	24.56	23.98	25.04	24.74	23.80	22.82	19.86	20.05	19.74	21.52	22.83
1915-19	49.20	49.06	48.82	49.56	49.48	48.48	49.30	49.38	47.64	55.62	58.74	58.96	51.19
1920-24	40.78	41.66	41.50	43.68	44.58	42.86	39.78	36.80	30.92	32.74	36.02	36.68	39.00
1925-29	33.38	34.70	36.44	37.11	38.48	38.24	37.00	34.92	33.60	32.72	31.10	31.00	34.89
1930-34	18.04	18.22	18.62	19.52	20.22	19.46	20.04	20.10	19.30	18.34	19.42	20.06	19.28
1935-39	31.78	32.10	32.20	32.76	32.74	31.28	30.12	26.64	26.36	27.22	27.40	27.92	29.88
1940	25.70	26.70	27.00	28.00	27.80	24.90	24.80	23.50	20.40	21.90	24.00	26.00	25.06
1941	26.00	25.50	26.30	27.00	29.00	33.30	34.70	37.40	49.80	52.30	48.90	48.60	36.57
1942	48.60	49.20	51.00	53.20	53.00	48.00	48.00	47.00	47.80	48.70	48.80	48.40	49.31
1943	48.80	47.80	48.00	49.00	49.00	49.00	49.00	53.00	54.00	54.00	53.00	54.00	50.72
1944	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	53.00	54.00	54.00	54.00	53.92
1945	53.00	52.00	51.00	51.00	52.00	52.00	52.00	53.00	53.00	53.00	54.00	54.00	52.50
1946	53.00	52.00	48.00	51.00	52.00	56.00	59.00	57.00	58.00	68.00	92.00	92.00	61.50
1947	91.00	90.00	93.00	97.00	87.00	81.00	82.00	79.00	80.00	95.00	92.00	99.00	88.83
1948	100.00	93.00	88.00	92.00	93.00	100.00	95.00	78.00	71.00	66.00	68.00	70.00	84.50
1949	67.00	55.00	55.00	55.00	54.00	50.00	47.30	47.00	45.00	43.50	43.30	43.00	50.43
1950	43.50	43.50	43.50	47.00	50.00	50.00	53.00	60.00	75.00	77.00	90.00	92.00	60.38
1951	96.00	98.00	98.00	98.00	99.00	94.00	75.00	68.00	69.00	70.00	72.00	72.00	84.08
1952	73.00	71.00	69.00	68.00	67.00	67.00	69.00	67.00	72.00	72.00	73.00	72.00	70.00
1953	72.00	72.00	72.00	70.00	68.00	66.00	62.00	59.00	53.00	54.00	54.50	55.00	63.13
1954	55.00	56.00	56.00	60.00	62.00	60.00	59.00	55.00	62.00	63.00	63.00	64.00	59.58
1955	63.00	63.00	64.00										

Cottonseed prices reached their peak for the 1910-54 period in June 1948. At that time cottonseed sold for an average of $100.00 per ton. The lowest average price recorded for the 45-year period was $9.00 per ton in September 1931 and July 1932. The higher price is a little over eleven times as great as the lower price. For year-to-year price changes see Table 36. For seasonal price movements see Tables 51 and 52 and Figures 24.

Table 16. Eggs: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Cents per dozen						
1910-14	24.0	20.2	17.2	15.2	14.6	15.2	14.8	16.0	18.8	20.6	22.6	25.4	18.7
1915-19	33.8	27.6	20.6	22.2	22.2	22.0	21.6	24.2	28.2	32.8	36.4	42.8	27.9
1920-24	40.4	31.6	25.6	20.6	20.4	21.0	22.8	26.4	31.0	35.0	40.4	45.8	30.1
1925-29	37.0	28.6	20.8	20.6	21.0	20.8	22.6	25.2	31.0	35.0	38.0	42.2	28.6
1930-34	23.2	16.3	12.4	13.0	12.6	12.8	13.4	15.9	19.3	21.4	22.4	24.9	17.3
1935-39	23.1	19.4	15.1	15.7	15.9	16.3	17.4	19.6	23.5	25.6	26.7	29.7	20.7
1940	22.9	26.1	13.8	14.1	14.4	14.9	16.0	18.1	19.9	21.9	23.4	27.4	19.4
1941	21.8	16.9	14.6	16.0	17.3	19.1	22.0	23.8	28.4	29.4	34.7	39.8	23.6
1942	29.9	23.5	20.7	21.2	22.5	23.6	24.9	27.4	33.7	37.4	39.4	41.7	28.8
1943	38.0	32.4	30.4	30.4	30.9	30.6	32.0	33.4	39.3	44.7	47.3	48.5	36.5
1944	46.2	32.7	27.0	24.5	25.3	26.2	28.4	31.3	37.3	44.2	48.0	50.9	35.2
1945	48.4	36.3	29.6	30.0	31.4	33.1	35.5	39.4	44.3	49.0	53.0	56.0	40.5
1946	55.0	36.7	29.3	29.3	31.4	34.7	40.2	45.2	52.0	56.0	58.0	58.0	43.8
1947	54.0	44.0	37.2	36.5	38.3	40.3	45.8	48.0	56.0	63.0	63.7	68.1	49.6
1948	60.0	55.0	39.5	37.9	39.5	41.2	42.8	46.7	55.0	58.4	60.8	64.1	50.1
1949	52.0	44.2	35.6	35.4	38.1	38.1	40.4	46.0	53.4	56.6	57.8	56.0	46.1
1950	39.5	31.8	29.8	29.5	28.3	29.7	36.0	41.9	46.8	48.0	51.2	71.0	40.3
1951	51.0	48.0	37.8	38.2	39.3	42.5	43.8	47.4	54.5	57.8	63.4	68.4	49.3
1952	50.4	40.2	32.9	32.5	33.1	36.7	41.0	48.2	52.2	54.7	59.2	60.0	45.1
1953	56.9	43.0	38.5	38.5	39.9	41.0	43.8	47.9	52.8	55.5	57.0	60.0	47.9
1954	57.0	48.0	37.0	34.0	34.5	36.0	37.0	41.5	43.0	42.0	42.0	45.0	41.4
1955	40.0	40.0	36.0										

The highest average price received by farmers for eggs during the 1910 - March 1955 period was 71 cents per dozen in December 1950. The lowest was 8 cents per dozen in March and April of 1933. The higher price is almost 9 times as high as the lower price. For year-to-year price changes see Table 37. For seasonal price movements see Figure 29.

Table 17. Hay: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
							Dollars per ton						
1910-14	11.95	12.53	12.67	12.47	12.65	12.71	12.47	12.21	11.99	12.04	12.14	12.21	12.34
1915-19	14.72	14.99	15.25	15.63	15.57	15.50	15.15	14.60	14.21	14.68	15.27	15.75	15.11
1920-24	16.10	16.62	17.02	17.46	17.48	17.48	16.84	15.65	15.21	14.54	15.00	14.91	16.19
1925-29	14.42	14.80	15.36	15.44	15.38	15.18	14.56	13.98	13.64	13.84	14.26	13.78	14.55
1930-34	10.08	10.30	10.40	10.64	10.90	10.80	10.38	10.10	9.80	9.70	9.56	9.32	10.17
1935-39	10.28	10.60	10.98	11.10	10.92	10.20	10.02	9.20	9.40	9.52	9.38	9.62	10.10
1940	8.50	9.00	9.00	9.50	9.80	9.50	8.50	8.00	7.90	7.90	8.00	8.50	8.68
1941	8.50	8.90	9.40	10.00	10.30	9.30	9.80	9.00	9.00	8.90	9.10	9.50	9.31
1942	10.50	10.50	11.10	11.40	11.30	10.70	10.00	10.00	10.40	10.60	11.00	12.00	10.79
1943	13.00	14.10	14.80	14.80	14.70	14.40	13.60	14.00	17.00	19.20	20.50	21.50	15.97
1944	22.20	23.00	24.00	23.50	23.00	21.00	20.00	20.00	19.00	20.00	21.00	21.80	21.54
1945	22.80	23.00	23.08	22.50	22.00	21.50	21.50	21.50	19.00	18.50	20.00	21.20	21.38
1946	21.20	22.20	22.20	22.20	22.50	21.00	24.50	22.50	21.00	23.50	24.50	24.00	22.61
1947	24.50	24.00	23.50	23.50	22.50	21.50	19.90	22.50	22.50	22.50	24.00	24.00	22.91
1948	25.50	26.50	26.50	28.00	27.00	26.20	24.30	23.00	22.60	22.30	22.00	22.50	24.70
1949	23.00	23.00	23.90	24.10	23.10	22.70	25.70	23.70	23.80	23.70	23.40	22.90	23.58
1950	22.90	22.90	23.00	23.00	23.30	23.30	22.40	23.10	23.50	24.10	24.30	25.30	23.43
1951	25.90	27.00	28.00	27.70	27.10	26.80	26.00	25.10	26.10	26.10	29.10	29.50	27.03
1952	30.90	30.50	30.60	30.60	29.70	29.00	28.00	29.80	31.30	30.70	31.50	31.80	30.37
1953	32.30	32.00	30.80	30.20	27.70	27.40	26.30	24.10	24.00	23.50	23.80	25.40	27.29
1954	24.80	25.60	26.30	26.10	25.40	23.80	24.00	24.40	24.50	24.60	26.40	26.20	25.18
1955	27.30	26.70	26.90										

During the period 1910 - March 1955 hay prices ranged from an average of $6.40 per ton in December 1932 to an average of $32.30 per ton in January 1953. The higher price is about five times as high as the lower price. For year-to-year price changes see Table 38. For seasonal price movements see Tables 51 and 52 and Figure 31.

Table 18. Hogs: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
	Dollars per cwt.												
1910-14	6.48	6.30	6.52	6.54	6.34	6.48	6.40	6.68	6.76	6.72	6.54	6.38	6.51
1915-19	9.60	9.30	9.72	10.12	10.40	10.34	10.62	11.00	11.04	11.12	10.74	10.92	10.41
1920-24	8.24	8.04	8.21	8.08	7.94	7.52	7.50	7.96	8.04	8.28	8.08	7.62	7.96
1925-29	8.70	8.74	8.84	8.72	8.70	8.34	9.16	9.24	9.42	9.42	9.36	9.18	8.99
1930-34	5.18	5.07	4.94	4.98	4.95	4.90	4.77	4.81	5.07	4.94	4.96	4.78	4.95
1935-39	6.54	6.50	6.64	6.66	6.44	6.60	6.64	7.10	7.32	7.42	7.06	6.78	6.81
1940	4.70	4.40	4.20	4.20	4.60	4.50	4.65	4.65	5.00	5.00	5.00	5.00	4.66
1941	5.50	5.70	5.70	6.20	6.90	7.20	8.30	8.80	9.20	9.20	8.80	8.90	7.53
1942	9.20	9.60	10.10	10.80	10.90	11.20	11.70	12.00	12.00	12.30	12.50	12.50	11.23
1943	12.80	12.80	13.20	13.30	12.90	12.30	12.20	12.40	12.40	12.40	12.00	11.20	12.49
1944	10.20	10.20	10.20	10.10	9.80	10.00	9.40	9.70	10.70	11.10	11.50	11.90	10.40
1945	11.90	11.90	11.90	12.30	12.50	12.70	13.00	13.00	13.30	13.30	13.50	13.60	12.74
1946	13.60	13.50	13.50	13.50	13.50	13.90	16.20	18.10	15.70	18.50	20.10	20.30	15.87
1947	18.20	19.30	23.70	21.60	19.20	20.40	20.40	21.60	23.40	23.70	22.50	22.90	21.41
1948	23.70	19.90	20.00	19.40	19.00	21.00	24.00	24.60	25.00	22.40	21.20	21.00	21.77
1949	19.40	17.50	18.00	17.40	17.00	18.40	18.60	18.60	18.60	17.30	16.00	14.80	17.63
1950	14.40	15.00	14.90	14.80	16.70	17.30	21.50	20.90	20.60	18.10	18.00	17.90	17.51
1951	19.00	20.00	20.00	19.50	19.50	19.50	20.40	20.50	19.50	20.00	18.40	17.70	19.50
1952	17.60	16.80	16.10	15.90	18.20	18.90	18.80	19.80	18.30	17.60	16.30	15.90	17.52
1953	16.80	17.30	18.30	18.60	21.30	21.50	22.60	21.40	22.30	20.70	19.50	21.30	20.13
1954	22.20	23.70	23.40	24.70	24.60	22.90	21.60	20.10	18.80	18.20	18.40	17.50	21.34
1955	16.80	16.20	14.90										

The highest average price received by farmers for hogs for the 1910 - March 1955 period was recorded for February 1954. Hog prices at that time averaged $23.70 per cwt. compared to an average of $2.90 in February 1933, the lowest recorded for the period. The February 1954 price is almost eight times as high as the February 1933 price. For year-to-year price changes see Table 39. For seasonal price movements see Tables 51 and 52 and Figure 32.

Table 19. Lambs: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
	Dollars per cwt.												
1910-14	4.14	4.64	5.00	4.56	4.32	4.70	4.42	4.18	4.80	4.44	4.12	4.22	4.46
1915-19	7.14	7.90	8.40	8.36	8.78	8.58	9.00	8.66	7.90	8.80	8.16	8.78	8.37
1920-24	7.32	7.66	7.62	7.26	7.64	7.48	7.42	6.62	6.64	6.72	6.28	5.98	7.05
1925-29	8.06	8.72	8.64	8.48	9.06	8.72	9.40	9.04	8.34	7.88	8.90	8.42	8.64
1930-34	5.45	5.91	5.51	5.58	5.64	5.38	5.61	5.22	5.03	4.72	4.85	4.45	5.32
1935-39	5.28	5.32	5.39	5.36	5.54	5.26	5.30	5.44	5.44	5.94	5.40	5.58	5.44
1940	5.20	5.20	5.50	5.50	5.60	5.60	5.40	5.50	5.70	5.50	5.30	5.50	5.46
1941	6.30	6.00	6.20	6.20	7.00	7.30	7.40	7.70	7.80	7.70	7.70	8.00	7.11
1942	8.50	8.70	8.70	9.00	9.70	10.50	11.40	11.30	10.90	10.50	11.00	11.20	10.12
1943	11.20	11.40	11.70	12.00	12.40	12.30	12.30	11.80	11.70	11.70	11.20	12.00	11.81
1944	12.00	12.20	12.00	12.00	12.00	12.00	11.00	10.60	11.00	11.30	11.30	11.30	11.56
1945	11.30	12.00	12.80	12.80	12.30	11.80	11.80	11.50	10.70	10.80	10.80	11.00	11.63
1946	10.20	10.20	10.20	10.50	10.90	12.90	12.00	11.00	11.00	12.00	13.00	12.80	11.39
1947	12.80	12.50	13.00	12.50	12.50	13.00	15.00	14.00	14.50	14.00	15.00	15.00	13.65
1948	15.00	14.00	13.50	15.00	16.50	16.50	18.00	18.00	18.00	17.50	17.50	17.50	16.42
1949	17.50	17.50	18.70	19.90	20.50	19.00	17.90	17.90	17.90	17.00	17.50	18.50	18.32
1950	17.80	18.50	19.00	18.80	18.80	19.00	20.00	20.00	20.00	20.00	22.00	22.50	19.70
1951	22.50	24.00	26.00	26.50	25.00	25.00	24.50	24.50	23.50	23.50	23.50	25.00	24.46
1952	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	24.00	21.50	21.00	21.00	23.96
1953	21.00	20.00	19.80	19.50	21.50	22.00	21.50	19.50	18.00	17.00	17.00	17.00	19.48
1954	18.00	18.50	19.50	21.00	22.00	21.50	18.50	17.80	17.00	17.00	17.00	17.00	18.73
1955	18.00	18.40	18.40										

Lamb prices reached their peak for the 1910 - March 1955 period in April of 1951. At that time prices received by farmers for lambs averaged $26.50 per cwt. compared to a low of $3.10 in August 1910. The higher price is almost nine times as high as the lower price. For year-to-year price changes see Table 40. For seasonal price movements see Tables 51 and 52 and Figure 30.

Table 20. **Milk, wholesale: Average prices received by farmers, Mississippi, 1910 - March, 1955.**

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per cwt.							
1910-14	2.47	2.41	2.36	2.20	2.05	2.01	2.03	2.11	2.17	2.27	2.40	2.49	2.25
1915-19	3.00	2.92	2.83	2.77	2.70	2.65	2.67	2.77	2.94	3.28	3.42	3.47	2.95
1920-24	3.69	3.60	3.47	3.41	3.20	3.10	3.12	3.18	3.35	3.44	3.38	3.21	3.35
1925-29	2.81	2.71	2.59	2.49	2.39	2.33	2.38	2.44	2.60	2.76	2.83	2.84	2.60
1930-34	1.80	1.72	1.64	1.52	1.48	1.49	1.48	1.54	1.60	1.74	1.81	1.77	1.63
1935-39	2.01	1.97	1.87	1.72	1.62	1.62	1.66	1.74	1.81	1.90	1.97	2.03	1.83
1940	2.00	1.95	1.85	1.80	1.70	1.65	1.70	1.70	1.75	1.85	1.95	2.05	1.83
1941	2.00	1.95	1.95	1.90	1.90	1.95	2.05	2.10	2.30	2.50	2.65	2.70	2.16
1942	2.70	2.65	2.55	2.50	2.45	2.30	2.30	2.40	2.65	2.90	3.05	3.20	2.64
1943	3.05	3.00	2.95	2.95	3.00	3.00	3.10	3.20	3.30	3.45	3.50	3.70	3.18
1944	3.60	3.50	3.35	3.20	3.10	3.05	3.20	3.25	3.35	3.40	3.60	3.70	3.36
1945	3.55	3.45	3.25	3.25	3.20	3.15	3.15	3.20	3.30	3.50	3.60	3.80	3.37
1946	3.60	3.50	3.35	3.25	3.35	3.60	4.35	4.60	4.90	5.60	6.00	5.90	4.33
1947	5.30	5.10	4.85	4.55	4.30	4.00	4.15	4.35	4.70	5.25	5.75	5.90	4.86
1948	5.70	5.45	5.10	4.80	4.80	4.80	5.00	5.20	5.40	5.55	5.70	5.75	5.27
1949	5.10	4.80	4.20	3.95	3.80	3.80	3.80	4.00	4.25	4.65	5.00	4.90	4.36
1950	4.65	4.45	4.20	3.75	3.80	3.90	3.95	4.15	4.50	4.85	5.30	5.35	4.40
1951	5.25	5.10	4.85	4.65	4.50	4.50	4.50	4.75	5.25	5.60	5.85	5.85	5.05
1952	5.80	5.65	5.40	4.95	4.75	4.75	4.80	5.05	5.50	6.05	6.30	6.05	5.42
1953	5.90	5.50	4.90	4.40	4.20	4.20	4.30	4.40	4.80	5.15	5.25	5.25	4.85
1954	5.05	4.80	4.35	3.75	3.75	3.75	3.85	4.00	4.40	4.80	5.00	5.05	4.38
1955	4.85	4.65	4.35										

During the period 1910 - March 1955, prices of milk ranged from an average of $1.05 per cwt. in July and August of 1932 to an average of $6.30 in November 1952. The November 1952 price is six times as high as the July and August 1932 price. For year-to-year price changes see Table 41. For seasonal price movements see Tables 51 and 52 and Figure 27.

Table 21. **Milk cows: Average price received by farmers, Mississippi, 1910 - March, 1955.**

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per head							
1910-14	30.68	30.74	32.32	31.86	33.14	32.50	32.70	32.92	32.60	33.10	32.48	31.76	32.23
1915-19	48.26	48.46	50.48	51.50	52.90	53.26	54.76	53.26	54.20	53.34	51.98	54.30	52.23
1920-24	40.28	41.06	41.02	41.96	42.00	42.30	39.28	39.84	37.80	38.34	36.66	33.84	39.53
1925-29	41.06	43.90	43.46	43.64	45.40	45.10	45.26	44.90	45.58	47.08	48.26	47.92	45.13
1930-34	29.60	29.40	29.80	30.80	30.20	28.80	25.00	25.20	24.40	24.40	24.40	23.60	27.13
1935-39	28.80	29.40	30.20	30.80	31.40	31.00	31.00	30.80	31.60	31.60	31.60	31.40	30.80
1940	35.00	35.00	37.00	37.00	37.00	37.00	37.00	36.00	35.00	35.00	35.00	36.00	36.00
1941	37.00	39.00	39.00	42.00	44 00	44.00	44.00	45.00	48.00	50.00	48.00	49.00	44.08
1942	50.00	53.00	54.00	56.00	59.00	58.00	58.00	58.00	60.00	59.00	62.00	62.00	57.42
1943	66.00	68.00	76.00	81.00	84 00	82.00	81.00	75.00	71.00	74.00	70.00	69.00	74.75
1944	68.00	68.00	70.00	72.00	72.00	69.00	64.00	64.00	64.00	65.00	64.00	65.00	67.08
1945	65.00	65.00	67.00	70.00	70.00	69.00	72.00	70.00	69.00	71.00	74.00	74.00	69.67
1946	77.00	77.00	77.00	81.00	81.00	81.00	83.00	82.00	84.00	85.00	90.00	89.00	82.25
1947	88.00	89.00	95.00	95.00	96 00	92.00	92.00	90.00	95.00	98.00	102.00	103.00	94.58
1948	106.00	106.00	106.00	115.00	115 00	116.00	123 00	129.00	129.00	129.00	128.00	129.00	119.25
1949	132.00	132.00	135.00	135.00	133.00	129.00	125.00	121.00	129.00	129.00	130.00	133.00	130.25
1950	134.00	134.00	136.00	137.00	139 00	143.00	143.00	153.00	158.00	155.00	152.00	154.00	144.83
1951	164.00	166.00	174.00	175.00	177.00	171.00	177.00	170.00	172.00	179.00	181.00	183.00	174.08
1952	180.00	189.00	191.00	183.00	184 00	184.00	175.00	170.00	165.00	161.00	151.00	150.00	173.58
1953	150.00	135.00	135.00	130.00	120.00	100.00	105.00	110.00	100.00	96.00	100.00	105.00	115.50
1954	100.00	100.00	100.00	100.00	95.00	92.00	85.00	86.00	81.00	86.00	84.00	84.00	91.08
1955	83.00	88.00	88.00										

Average prices received by farmers for milk cows sold ranged from a low of $17.00 per head in February 1933 to a high of $191.00 per head in March 1952. The higher price is a little more than eleven times as high as the lower price. For year-to-year price changes see Table 42. For seasonal price movements see Tables 51 and 52 and Figure 32.

Table 22. Oats: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per bushel							
1910-14	.63	.64	.63	.63	.63	.63	.63	.63	.63	.62	.61	.61	.63
1915-19	.82	.84	.85	.86	.87	.88	.86	.87	.88	.89	.89	.89	.87
1920-24	.79	.81	.78	.76	.77	.79	.81	.78	.77	.77	.74	.73	.78
1925-29	.70	.74	.71	.70	.69	.70	.69	.69	.68	.72	.70	.73	.70
1930-34	.51	.53	.51	.50	.49	.50	.50	.49	.52	.52	.53	.53	.51
1935-39	.56	.58	.59	.58	.55	.51	.50	.49	.51	.53	.53	.52	.54
1940	.47	.48	.51	.52	.51	.44	.39	.39	.40	.43	.45	.45	.45
1941	.45	.44	.45	.48	.45	.40	.40	.42	.47	.51	.51	.54	.46
1942	.55	.55	.56	.57	.57	.53	.52	.54	.56	.58	.58	.60	.56
1943	.64	.68	.69	.76	.79	.75	.79	.82	.94	.97	1.02	1.08	.83
1944	1.08	1.08	1.08	1.08	1.08	.95	.94	.92	.94	1.01	.98	1.01	1.01
1945	1.01	1.01	1.01	.98	.95	.71	.73	.75	.75	.78	.78	.81	.86
1946	.81	.86	.91	.91	.94	1.01	1.13	1.10	1.11	1.05	1.10	1.10	1.00
1947	1.02	1.04	1.10	1.10	1.15	1.01	1.06	1.13	1.23	1.28	1.35	1.36	1.15
1948	1.37	1.25	1.30	1.35	1.32	1.09	1.05	1.02	.98	1.05	.96	.98	1.14
1949	.99	.87	.98	.98	.91	.87	.83	.86	.87	.94	1.00	.90	.92
1950	.90	.90	.90	1.01	1.03	.97	.98	.99	1.05	1.06	1.15	1.15	1.01
1951	1.05	1.13	1.05	1.10	1.04	1.04	.95	1.01	1.04	1.14	1.19	1.18	1.08
1952	1.18	1.19	1.17	1.17	1.19	1.00	.97	1.05	1.20	1.25	1.21	1.13	1.14
1953	1.20	1.10	1.05	1.04	.98	.80	.77	.89	.94	.98	.99	.95	.97
1954	.95	.94	.94	.94	.93	.71	.76	.78	.83	.85	.93	.95	.88
1955	.95	.95	.95										

Oat prices reached their peak for the period 1910 - March 1955 in December 1947. At that time the average price received by farmers was $1.36 per bushel compared to a low of 30 cents per bushel in July and August of 1932. From the lower price to the higher price represents a change of 353 percent in oat prices. For year-to-year price changes see Table 43. For seasonal price movements see Tables 51 and 52 and Figure 25.

Table 23. Potatoes: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per bushel							
1910-14	1.08	1.16	1.22	1.21	1.13	1.05	1.02	1.09	1.11	1.04	.99	1.01	1.09
1915-19	1.49	1.80	2.01	1.91	1.69	1.52	1.45	1.40	1.46	1.52	1.52	1.58	1.61
1920-24	1.87	2.03	2.29	2.33	2.21	2.03	1.91	1.91	1.76	1.83	1.75	1.74	1.97
1925-29	1.89	1.95	2.10	2.11	2.13	1.96	1.69	1.64	1.68	1.61	1.88	1.68	1.86
1930-34	1.05	1.16	1.20	1.22	1.19	.90	.86	.96	1.03	.99	.98	.96	1.04
1935-39	1.06	1.17	1.21	1.14	.96	.79	.89	.99	1.02	1.00	1.00	1.06	1.02
1940	1.10	1.15	1.20	1.20	.80	.68	.80	.85	.90	.90	.95	.95	.96
1941	1.00	1.05	1.10	1.10	.50	.61	.60	.70	1.00	1.05	1.15	1.20	.92
1942	1.30	1.45	1.60	1.65	1.10	.85	1.24	.95	1.25	1.40	1.40	1.50	1.31
1943	1.50	1.55	1.60	1.75	1.60	1.50	1.50	1.60	1.80	1.80	1.80	1.90	1.66
1944	2.00	2.15	2.20	2.20	1.15	1.15	1.15	1.80	2.00	2.00	2.15	2.40	1.86
1945	2.30	2.40	2.65	2.50	1.45	1.40	1.65	1.90	2.15	2.35	2.20	2.25	2.10
1946	2.30	2.35	2.30	2.20	1.15	1.35	1.50	1.70	1.95	2.20	2.05	2.05	1.92
1947	2.05	2.15	2.35	2.35	2.35	1.25	1.60	1.85	2.25	2.50	2.60	2.65	2.16
1948	2.60	2.60	2.70	2.70	2.70	1.85	2.10	2.30	2.30	2.40	2.25	2.40	2.41
1949	2.40	2.40	2.40	2.25	2.10	2.25	2.50	2.50	2.50	2.30	2.40	2.35	2.36
1950	2.45	2.50	2.50	2.35	1.60	1.75	2.00	2.25	2.30	2.15	2.10	2.20	2.18
1951	2.15	2.25	2.30	2.30	2.00	1.65	1.75	2.00	2.20	2.25	2.25	2.50	2.13
1952	2.60	2.60	2.60	2.60	2.50	3.60	3.00	3.30	3.35	3.00	3.00	3.00	2.93
1953	3.00	3.00	3.00	2.80	1.00	1.20	1.80	1.90	1.90	1.90	2.00	2.00	2.13
1954	2.00	NR*	NR*	NR*	1.55	1.45	1.50	1.85	2.10	2.10	2.10	2.10	1.86
1955	NR*	NR*	NR*										

*Not reported.

Potatoes are becoming relatively less and less important as a source of farm income in Mississippi. And, accordingly, the United States Department of Agriculture no longer reports potato prices each month. For the period 1910-54 the highest average price received for potatoes was $3.60 per bushel in June 1952 and the lowest was 60 cents per bushel in July 1932. The higher price is six times as high as the lower price. For year-to-year price changes see Table 44. For seasonal price movements see Tables 51 and 52 and Figure 26.

Table 24. Rice: Average prices received by farmers, Mississippi, 1951 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per cwt.							
1951	5.65	5.70	5.70	5.70	5.70	5.70	5.70	4.90	4.20	4.70	4.90	5.00	5.30
1952	5.10	5.30	5.30	5.30	5.50	5.50	5.50	5.30	5.30	5.60	5.80	5.90	5.45
1953	6.30	6.30	6.70	6.70	6.70	6.70	6.00	5.50	4.75	5.10	4.75	4.85	5.86
1954	4.85	4.85	5.00	4.90	4.75	4.00	3.80	3.80	4.00	4.20	4.20	4.10	4.37
1955	4.10	4.05	4.15										

Rice has become an important source of farm income in Mississippi only in the post war years. Prices received by farmers for rice have been reported only since January 1951. From that time through March 1955, rice prices have ranged from $3.80 per cwt. to $6.70 per cwt.

Table 25. Sheep: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per cwt.							
1910-14	3.44	3.54	3.82	3.66	3.96	3.98	3.86	3.46	3.86	3.56	3.64	3.40	3.68
1915-19	5.50	6.02	6.48	6.54	6.98	6.60	7.10	6.36	6.24	6.42	6.08	6.44	6.40
1920-24	5.36	5.46	5.18	5.29	5.48	5.04	4.82	4.74	4.70	5.12	4.50	4.46	5.01
1925-29	5.26	5.84	5.56	5.64	5.84	5.38	5.46	5.38	5.76	5.26	5.60	5.40	5.53
1930-34	3.66	3.76	3.60	3.77	3.66	3.49	3.62	3.56	3.26	3.06	3.04	2.78	3.44
1935-39	3.39	3.55	3.51	3.41	3.42	3.32	3.34	3.35	3.41	3.57	3.43	3.64	3.45
1940	3.20	3.40	3.40	3.40	3.40	3.40	3.60	3.65	3.60	3.50	3.30	3.50	3.45
1941	3.50	3.80	3.80	3.80	4.15	4.00	4.00	4.00	4.05	4.05	4.10	4.10	3.95
1942	4.40	4.40	4.65	4.45	4.75	4.30	4.30	4.30	4.30	4.00	4.40	5.00	4.44
1943	5.00	5.10	5.80	5.80	5.80	5.50	5.50	5.50	5.50	5.00	5.00	5.90	5.45
1944	5.90	5.70	5.50	5.50	5.50	5.50	5.30	5.30	5.30	5.50	5.50	5.50	5.50
1945	5.50	5.90	6.20	6.20	6.00	6.00	6.00	5.50	5.50	5.60	5.60	5.70	5.81
1946	5.70	6.00	6.00	6.40	6.60	6.60	7.80	6.90	6.90	7.50	6.90	6.80	6.67
1947	6.80	6.80	7.00	7.00	7.00	6.70	6.70	7.00	7.00	7.70	8.00	8.00	7.14
1948	8.00	7.50	7.50	8.00	8.50	8.50	8.50	9.00	9.50	8.80	9.00	9.00	8.48
1949	9.00	9.00	9.80	10.00	10.00	8.50	8.50	9.00	8.80	8.20	8.30	8.50	8.97
1950	8.50	9.50	10.00	9.20	9.50	10.20	10.20	10.20	10.20	10.50	11.00	11.00	10.00
1951	11.30	12.50	13 50	13.50	13.20	13.20	13.00	13.00	12.80	13.00	13.00	13.00	12.92
1952	13.00	13.00	12.70	12.40	12.40	12.40	11.40	10.40	10.00	9.20	9.00	9.00	11.24
1953	9.00	9.00	9.00	8.50	8.50	7.50	7.50	7.50	7.00	6.50	6.00	6.00	7.67
1954	6.00	6.20	6.50	6.50	6.50	6.50	6.00	5.50	5.50	5.50	5.50	5.50	5.98
1955	5.50	5.50	5.50										

Sheep prices reached their highest peak for the 1910 - March 1955 period in 1951 and 1952. An average price of $13.00 per cwt. was recorded for July, August, October, November, and December of 1951 and for January and February 1952. The lowest average price recorded for the period was $2.25 per cwt. in April and December of 1933 and January 1934. The higher price is almost six times as high as the lower price. For year-to-year price changes see Table 45. For seasonal price movements see Tables 51 and 52 and Figure 30.

Table 26. Soybeans: Average prices received by farmers, Misissippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per bushel							
1910-14	2.00[1]	2.08[1]								1.55[2]	1.73[2]		1.77
1915-19	2.34	2.41								2.41[3]	2.49[4]	2.58	2.44
1920-24	2.51[5]	2.59								2.15	2.54	2.58	3.30
1925-29	2.80	2.71	2.82	3.11	3.36	3.25	3.29	3.01	2.88	2.84	2.74	2.60	2.95
1930-34	1.77	1.79	1.85	1.99	2.08	2.14	1.98	2.07	1.76	1.45	1.45	1.47	1.82
1935-39	1.64	1.74	1.83	2.01	2.01	1.98	1.98	1.78	1.75	1.56	1.41	1.44	1.76
1940	1.35	1.45	1.60	1.70	1.85	1.80	1.70	1.50	1.45	1.20	1.10	1.15	1.49
1941	1.15	1.40	1.40	1.60	1.70	1.60	1.55	1.30	1.30	1.50	1.50	1.55	1.46
1942	1.75	2.05	2.30	2.30	2.45	2.30	2.30	1.95	1.90	1.80	1.60	1.65	2.03
1943	1.65	1.85	2.05	2.35	2.65	2.65	2.65	2.30	2.20	2.10	2.25	2.25	2.25
1944	2.35	2.50	2.55	2.60	2.65	2.70	2.50	2.30	2.30	2.35	2.15	2.15	2.42
1945	2.25	2.50	3.10	3 20	3.40	3.20	3.20	2.95	2.60	2.35	2.10	2.25	2.76
1946	2.45	2.65	2.85	3.15	3.70	3.70	3.70	3.05	2.75	2.55	2.85	2.85	3.02
1947	2.90	3.10	3.40	3.65	3.85	3.75	3.65	3.65	2.95	3.00	3.00	3.25	3.35
1948	3.65	3.00	4.00	4.00	4.10	4.00	4.00	3.00	2.25	2.15	2.10	2.25	3.20
1949	2.25	2.35	2.35	2.55	2.30	2.25	2.10	2.15	2.10	2.00	1.94	2.10	2.20
1950	2.20	2.35	2.35	2.50	2.70	2.45	2.50	2.35	2.25	1.95	2.30	2.40	2.36
1951	2.70	2.95	3.05	3.00	3.10	3.00	2.80	2.60	2.50	2.40	2.70	2.70	2.79
1952	2.75	2.75	2.75	2.85	2.75	2.95	2.85	2.90	2.75	2.75	2.70	2.70	2.79
1953	2.65	2.70	2.80	2.90	2.90	2.80	2.65	2.50	2.30	2.40	2.50	2.60	2.64
1954	2.70	2.85	3.10	3.35	3.35	3.10	2.85	2.70	2.60	2.35	2.50	2.55	2.83
1955	2.60	2.75	2.70										

[1] One year, 1914.

[2] Two year average, 1913-14.

[3] Four year average, 1916-19.

[4] Three year average, 1915, 1917, and 1919.

[5] Four year average, 1920-22 and 1924.

Soybean prices were not reported each month until 1925. Since 1925, the average price received by farmers for soybeans has ranged from a low of 95 cents per bushel in January and February 1933 to a high of $4.10 per bushel in May 1948. Percentagewise, this change amounted to 344 percent. For year-to-year changes see Table 46. For seasonal price movements see Tables 51 and 52 and Figure 31.

Table 27. Sweet Potatoes: Average prices received by farmers, Mississippi, 1910-March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per bushel							
1910-14	.72	.76	.78	.83	.88	.84	.81	.83	.81	.75	.62	.63	.77
1915-19	.81	.93	1.07	1.05	1.03	1.00	.98	1.14	1.08	1.99	.87	.87	.99
1920-24	1.04	1.11	1.20	1.25	1.28	1.34	1.36	1.36	1.24	1.25	1.01	1.02	1.20
1925-29	1.18	1.31	1.41	1.42	1.44	1.52	1.50	1.54	1.38	1.17	.98	.90	1.31
1930-34	.65	.70	.74	.76	.78	.79	.77	.90	.82	.70	.57	.59	.73
1935-39	.70	.75	.77	.78	.81	.79	.85	.97	.87	.74	.66	.68	.78
1940	.75	.85	.85	.90	.90	.90	.90	1.00	1.00	.85	.80	.85	.88
1941	.95	.95	1.00	1.10	1.10	1.00	1.00	1.15	.90	.90	.80	.80	.97
1942	.85	.90	.95	1.05	1.05	1.05	1.00	1.10	1.15	1.05	1.00	1.00	1.01
1943	1.10	1.10	1.25	1.50	1.55	1.45	2.50	2.50	2.45	2.15	1.65	1.65	1.74
1944	1.85	1.85	1.95	2.00	2.00	2.00	2.50	2.50	2.50	2.30	2.00	1.95	2.12
1945	2.00	2.05	2.20	2.20	2.10	2.10	2.95	2.95	2.55	2.25	2.15	2.00	2.29
1946	2.25	2.25	2.25	2.50	2.50	2.40	2.40	3.50	2.85	2.45	2.05	2.20	2.47
1947	2.30	2.40	2.55	2.50	2.50	2.60	2.75	3.25	3.05	2.60	2.20	2.20	2.58
1948	2.30	2.50	2.50	2.60	2.60	2.60	2.60	3.15	2.70	2.55	2.10	2.20	2.53
1949	2.35	2.35	2.50	2.45	2.65	2.45	2.90	3.35	2.70	2.25	2.10	2.15	2.52
1950	2.25	2.35	2.45	2.50	2.60	2.50	2.50	2.75	2.40	1.95	1.60	1.90	2.31
1951	2.00	2.20	2.20	2.20	2.25	2.25	2.20	2.50	2.75	3.15	3.15	3.35	2.52
1952	3.75	3.75	4.10	4.35	4.35	4.50	4.50	4.95	4.50	4.00	3.95	4.20	4.24
1953	4.60	4.60	4.80	5.00	5.20	4.40	3.80	4.00	4.00	3.20	2.90	3.15	4.14
1954	3.35	3.45	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.30	2.95	3.00	3.37
1955	3.20	3.50	3.35										

For the 1910 - March 1955 period the average price received by farmers for sweet potatoes reached its highest point in August 1952. Sweet potato prices at that time were $4.95 per bushel compared to a low of 37 cents per bushel in January 1933. The higher price is a little over thirteen times as high as the lower price. For year-to-year changes see Table 47. For seasonal price movements see Tables 51 and 52 and Figure 26.

Table 28. Turkeys: Average price received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Cents per pound							
1910-14	13.9*									13.7**	13.6**	13.5**	13.7
1915-19	18.0									19.6	20.2	22.3	20.0
1920-24	27.8									27.4	26.2	26.6	27.0
1925-29	28.3									27.6	28.2	28.4	28.2
1930-34	16.2									14.8	15.4	14.8	24.2
1935-39	16.4	16.0	15.6	15.6	15.2	15.6	15.4	15.2	16.0	16.0	17.2	17.4	16.0
1940	16.0	16.0	15.0	15.0	16.0	15 0	15.0	15.0	15.0	16.0	17.0	17.0	15.7
1941	16.0	16.0	16.0	16.0	17.0	17.0	17.0	17.0	18.0	18.0	19.0	20.0	17.2
1942	20.0	20.0	20.0	21.0	20.8	20.0	21.0	21.0	21.0	21.0	24.6	26.5	21.4
1943	26.5	25.0	25.0	27.0	28.0	28.0	28.0	27.0	27.0	28.0	32.0	34.0	28.0
1944	34.3	32.0	32.0	31.0	31.0	29.0	29.0	29.0	31.0	31.0	34.5	36.0	31.6
1945	34.5	32.0	32.0	33.0	34.0	35.0	34.0	35.0	34.0	35.0	36.0	36.5	34.2
1946	35.0	34.0	34.0	32.0	34.0	35.0	36.0	37.0	35.0	37.0	40.0	41.0	35.8
1947	38.0	35.0	37.0	37.0	36.0	37.0	38.0	36.0	39.0	38.0	40.0	42.5	37.8
1948	42.5	39.5	38.0	38.0	39.0	39.0	39.0	38.0	38.0	38.0	43.0	49.0	40.1
1949	44.0	42.0	42.0	40.0	37.0	37.0	35.0	35.0	35.0	35.0	37.0	38.5	38.1
1950	38.0	34.0	34.0	34.0	32.0	32.0	32.0	34.0	36.0	34.0	39.0	39.0	34.8
1951	39.0	38.0	38.0	39.0	39.0	38.0	38.0	39.0	40.0	38.0	39.0	40.0	38.8
1952	40.0	35.0	38.0	36.0	34.0	36 0	34.0	35.0	36.0	36.0	33.0	38.0	35.9
1953	35.0	37.0	37.0	36.0	35.0	35.0	33.0	35.0	36.0	36.0	36.0	37.0	35.7
1954	37.0	37.0	35.0	34.0	34.0	34.0	33.0	33.0	33.0	33.0	32.0	32.0	33.9
1955	31.0	32.0	32.0										

*Two year average, 1913-14.

**Three year average, 1912-14.

Turkey prices have been reported each month only since 1933. From that time through March 1955 the average prices received by farmers for turkeys has ranged from a low of 9 cents per pound in January 1933 to a high of 49 cents per pound in December 1948. From the lower price to the higher price represents an increase of 444 percent in turkey prices. For year-to-year price changes see Table 48. For seasonal price movements see Tables 51 and 52 and Figure 33.

Table 29. Wool: Average prices received by farmers, Mississippi, 1910 - March, 1955.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
						Dollars per pound							
1910-14	.19	.19	.19	.16	.18	.18	.18	.19	.16	.16	.17	.16	.18
1915-19	.30	.29	.31	.31	.32	.33	.34	.35	.33	.34	.34	.35	.32
1920-24	.23	.23	.22	.23	.23	.24	.24	.23	.23	.23	.22	.20	.23
1925-29	.31	.30	.30	.30	.31	.31	.32	.32	.33	.33	.31	.33	.31
1930-34	.19	.19	.18	.17	.16	.16	.17	.18	.17	.17	.17	.17	.17
1935-39	.21	.21	.21	.21	.22	.23	.23	.24	.24	.24	.24	.23	.23
1940	.25	.24	.24	.24	.25	.25	.27	.27	.28	.28	.27	.27	.26
1941	.28	.28	.28	.28	.30	.33	.34	.35	.38	.38	.38	.38	.33
1942	.38	.38	.39	.39	.39	.39	.40	.40	.40	.40	.40	.40	.39
1943	.41	.43	.45	.45	.45	.45	.45	.45	.44	.44	.44	.44	.44
1944	.43	.43	.43	.43	.43	.45	.47	.47	.48	.46	.45	.45	.45
1945	.45	.45	.45	.45	.45	.45	.45	.46	.48	.50	.49	.47	.46
1946	.45	.45	.45	.46	.46	.46	.46	.47	.47	.49	.49	.45	.46
1947	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44
1948	.44	.43	.43	.44	.44	.45	.45	.45	.45	.45	.45	.45	.44
1949	.44	.43	.43	.43	.43	.41	.41	.41	.41	.41	.40	.41	.42
1950	.41	.41	.41	.42	.42	.45	.46	.46	.48	.50	.50	.55	.46
1951	.70	.75	.85	1.00	.95	1.00	.95	.90	.75	.75	.75	.70	.84
1952	.70	.65	.60	.57	.55	.55	.50	.50	.48	.48	.48	.48	.54
1953	.48	.48	.49	.58	.59	.59	.59	.57	.55	.52	.51	.51	.54
1954	.52	.52	.51	.54	.54	.54	.54	.53	.53	.53	.52	.52	.53
1955	.52	.54	.54										

An average price of $1.00 per pound for wool was recorded for April and June of 1951. The lowest average price recorded during the 1910 - March 1955 period was 7 cents per pound in July 1932. The April and June 1951 price is a litle over fourteen times the July 1932 price. For year-to-year price changes see Table 49. For seasonal price movements see Tables 51 and 52 and Figure 33.

Table 30. Year-to-year changes in prices received for beef cattle, Mississippi, 1910-54.

Size of change (dollars per cwt.)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .20	3	3	7*	7
.20 - .49	6	4	10	17
.50 - .99	6	4	10	27
1.00 - 1.99	7	3	10	37
2.00 - 2.99	2	2	4	41
3.00 or more	2	1	3	44
Total	26	17	44	

Greatest change: from 1952 to 1953 a decrease of $9.79 per hundred pounds.

*No change 1 year.

Beef cattle prices averaged within 50 cents per hundred pounds of the price for the year before in 17 years and within $1.00 per hundred pounds in 27 years out of a total of 44. In only 3 years did the average price per hundred pounds differ from the average for the previous year by as much as $3.00.

Table 31. Year-to-year changes in prices received for butterfat, Mississippi, 1910-54.

Size of change (cents per pound)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	12	7	24*	24
5 - 9	11	4	15	39
10 - 14	1	3	4	43
15 or more	0	1	1	44
Total	24	15	44	

Greatest change: from 1920 to 1921 a decrease of 18 cents per pound.

*No change 5 years.

The change in butterfat prices from one year to the next was less than 5 cents per pound in 24 years out of 44, and less than 10 cents per pound in 39 years out of 44. In only 1 year out of 44 did the average price per pound differ from the average price for the year before by as much as 15 cents.

Table 32. Year-to-year changes in prices received for calves, Mississippi, 1910-54.

Size of change (dollars per cwt.)	No. years changes occurred: Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .50	7	6	13	13
.50 - .99	7	4	11	24
1.00 - 1.99	8	3	11	35
2.00 - 2.99	2	2	4	39
3.00 - 3.99	1	1	2	41
4.00 or more	2	1	3	44
Total	27	17	44	

Greatest change: from 1952 to 1953 a decrease of $10.11 per hundred pounds.

The average price of calves per hundred pounds was within $1.00 of the average for the year before in 24 years out of 44, and within $3.00 of the previous year's average in 39 of the 44 years. In only 3 years was the average price more than $4.00 per hundred pounds above or below the price for the year before.

Table 33. Year-to-year changes in prices received for chickens, Mississippi, 1910-54.

Size of change (cents per pound)	No. years changes occurred: Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 1.0	7	8	16*	16
1.0 - 1.9	7	3	10	26
2.0 - 2.9	5	2	7	33
3.0 - 3.9	3	2	5	38
4.0 - 4.9	1	3	4	42
5.0 or more	1	1	2	44
Total	24	19	44	

Greatest change: from 1942 to 1943 an increase of 6.1 cents per pound.

*No change 1 year.

Chicken prices averaged within 2 cents per pound of the previous year's average in 26 years out of 44 and within 4 cents per pound of the previous year's average in 38 years out of 44. In only 2 years out of 44 did chicken prices differ from the average for the year before by as much as 5 cents per pound.

Table 34. Year-to-year changes in prices recevied for corn, Mississippi, 1910-54.

Size of change (cents per bushel)	No. years changes occurred: Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	5	3	8	8
5 - 14	9	7	16	24
15 - 24	7	1	8	32
25 - 34	3	3	6	38
35 - 44	2	1	3	41
45 or more	1	2	3	44
Total	27	17	44	

Greatest change: from 1920 to 1921 a decrease of 90 cents per bushel.

Corn prices for the year averaged within 15 cents per bushel of the previous year's average in 24 years and within 25 cents of the previous year's average in 32 years of a total of 44. In 3 of the 44 years corn prices differed from those of the year before by 45 cents or more.

Table 35. Year-to-year changes in prices received for cotton, Mississippi, 1910-54.

Size of change (cents per pound)	No. years changes occurred Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 1.0	6	3	9	9
1.0 - 1.9	6	6	12	21
2.0 - 2.9	2	1	3	24
3.0 - 3.9	1	2	3	27
4.0 - 4.9	4	2	6	33
5.0 - 5.9	1	2	3	36
6.0 - 6.9	4	0	4	40
7.0 or more	2	2	4	44
Total	26	18	44	

Greatest change: from 1920 to 1921 a decrease of 18.4 cents per pound.

Cotton prices averaged within 2 cents per pound of the average for the year before in 21 years and within 5 cents per pound of the previous year's average in 33 years out of a total of 44. In 4 years of the 1910-54 period the average cotton prices differed from that of the previous year by 7 cents or more.

Table 36. Year-to-year changes in prices received for cottonseed, Mississippi, 1910-54.

Size of change (dollars per ton)	No. years changes occurred Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 3.00	5	5	10	10
3.00 - 5.99	3	6	9	19
6.00 - 9.99	4	5	9	28
10.00 - 14.99	6	4	10	38
15.00 - 19.99	2	0	2	40
20.00 or more	3	1	4	44
Total	23	21	44	

Greatest change: from 1948 to 1949 a decrease of $34.07 per ton.

The average cottonseed price for the year was within $6.00 per ton of the average price for the year before in 19 years and within $10.00 per ton of the average for the year before in 28 years of the 1910-54 period. In 4 years of the 44 the average price per ton differed by $20.00 or more from the average price for the previous year.

Table 37. Year-to-year changes in prices received for eggs, Mississippi, 1910-54.

Size of change (cents per dozen)	No. years changes occurred Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 1.0	5	5	10	10
1.0 - 2.9	6	6	12	22
3.0 - 4.9	8	3	11	33
5.0 - 6.9	3	3	6	39
7.0 or more	3	2	5	44
Total	25	19	44	

Greatest change: from 1920 to 1921 a decrease of 15.1 cents per dozen.

The average price per dozen for eggs was within 3 cents of the average price for the preceeding year in 22 years of the 1910-54 period. In 33 years of the period the average price per dozen was within 5 cents of the average price for the year before. In only 5 years of the 44 years did the average price per dozen differ by as much as 7 cents from the average of the year before.

Table 38. Year-to-year changes in prices received for hay, Mississippi, 1910-54.

Size of change (dollars per ton)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .25	2	3	5	5
.25 - .49	6	1	7	12
.50 - .99	4	4	8	20
1.00 - 1.99	6	5	11	31
2.00 - 4.99	6	2	8	39
5.00 or more	3	2	5	44
Total	27	17	44	

Greatest change: from 1953 to 1954 a decrease of $12.11 per ton.

The average price farmers received for hay differed from the average of the year before by less than $1.00 per ton in 20 years of the period 1910-54. In another 11 years the difference was only between $1.00 and $2.00. In only 5 years out of the total of 44 did the average price of hay differ from the previous year's average by as much as $5.00 per ton.

Table 39. Year-to-year changes in prices received for hogs, Mississippi, 1910-54.

Size of change (dollars per cwt.)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .50	8	3	11	11
.50 - .99	3	4	7	18
1.00 - 1.99	4	7	11	29
2.00 - 3.99	8	3	11	40
4.00 or more	2	2	4	44
Total	25	19	44	

Greatest change: from 1946 to 1947 an increase of $5.54 per hundred pounds.

Hog prices averaged within $1.00 per hundred pounds of the previous year's price in 18 years out of 44. In 29 of the 44 years the average price for the year was within $2.00 per hundred pounds of the average for the year before. In only 4 years did the average price of hogs differ from the year before by as much as $4.00 per hundred pounds.

Table 40. Year-to-year changes in prices received for lambs, Mississippi, 1910-54.

Size of change (dollars per cwt.)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .50	10	8	18	18
.50 - .99	3	5	8	26
1.00 - 1.99	7	2	9	35
2.00 2.99	4	1	5	40
3.00 or more	2	2	4	44
Total	26	18	44	

Greatest change: from 1950 to 1951 an increase of $4.76 per hundred pounds.

Lamb prices averaged within 50 cents per hundred pounds of the average for the year before in 18 years of the 1910-54 period, and within $1.00 per hundred pounds in 26 of the 44 years. In 4 years the average price for the year was more than $3.00 above or below the average price for the previous year.

Table 41. **Year-to-year changes in prices received for milk, Mississippi, 1910-54.**

Size of change (cents per cwt.)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	4	2	9*	9
5 - 19	9	3	12	21
20 - 49	7	5	12	33
50 - 89	4	3	7	40
90 or more	2	2	4	44
Total	26	15	44	

Greatest change: from 1920 to 1921 a decrease of $1.11 per cwt.

*No change 3 years.

Milk prices averaged within 20 cents per hundred pounds of the average price for the year before in 21 years of the 1910-54 period. In another 12 years milk prices were only between 20 and 50 cents per hundred pounds different from that for the previous years. In only 4 years of the 44 did the difference from the year before amount to a much as 90 cents per hundred pounds.

Table 42. **Year-to-year changes in prices received for milk cows, Mississippi, 1910-54.**

Size of change (dollars per head)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 1.00	5	3	8	8
1.00 - 4.99	7	3	10	18
5.00 - 9.99	7	4	11	29
10.00 - 19.99	8	2	10	39
20.00 or more	2	3	5	44
Total	29	15	44	

Greatest change: from 1952 to 1953 a decrease of $58.08 per head.

Milk cow prices averaged within $5.00 per head of the previous year's average in 18 years of the period 1910-54 and within $10.00 per head in 29 years. For 5 years of the 44 the difference amounted to $20.00 or more per head.

Table 43. **Year-to-year changes in prices received for oats, Mississippi, 1910-54.**

Size of change (cents per bushel)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 3	6	3	9	9
3 - 7	7	5	12	21
8 - 14	7	4	11	32
15 - 24	4	5	9	41
25 or more	2	1	3	44
Total	26	18	44	

Greatest change: from 1920 to 1921 a decrease of 44 cents per bushel.

The average price of oats changed from the year before by less than 7 cents per bushel in 21 years of the 1910-54 period and by less than 15 cents per bushel in 32 years. The change was greater than 25 cents per bushel in only 3 years of the 44-year period.

Table 44. **Year-to-year changes in prices received for potatoes, Mississippi, 1910-54.**

Size of change (cents per bushel)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	3	3	7*	7
5 - 19	5	9	14	21
20 - 39	10	3	13	34
40 - 69	1	4	5	39
70 or more	3	2	5	44
Total	22	21	44	

Greatest change: from 1920 to 1921 a decrease of $1.32 per bushel.

*No change 1 year.

The average price for potatoes was within 20 cents per bushel of the average for the year before in 21 years out of 44, and within 40 cents per bushel in 34 years. In 5 years of the 1910-54 period the average price of potatoes differed from the average for the previous year by 70 cents or more per bushel.

Table 45. Year-to-year changes in prices received for sheep, Mississippi, 1910-54.

Size of change (dollars per cwt.)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than .50	17	6	24*	24
.50 - .99	5	2	7	31
1.00 - 1.99	4	5	9	40
2.00 - 2.99	2	1	3	43
3.00 or more	0	1	1	44
Total	28	15	44	

Greatest change. from 1952 to 1953 a decrease of $3.57 per hundred pounds.

*No change 1 year.

In 24 years of the period 1910-54 the average price received for sheep was less than 50 cents per hundred pounds different from the average for the year before. In another 7 years the difference was only between 50 cents and $1.00 per hundred pounds. In only 1 year of the 44 was the average price for the year as much as $3.00 per hundred pounds above or below the price for the year before.

Table 46. Year-to-year changes in prices received for soybeans, Mississippi, 1913-54.

Size of change (cents per bushel)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	3	1	6*	6
5 - 24	6	5	11	17
25 - 49	11	3	14	31
50 - 74	3	3	6	37
75 or more	1	3	4	41
Total	24	15	41	

Greatest change: from 1931 to 1932 a decrease of $1.04 per bushel.

*No change 2 years.

Soybean prices averaged within 25 cents per bushel of the average price for the year before 17 years out of a total of 41. For another 14 years the difference was between 25 and 50 cents per bushel. In 4 years of the 41 the difference amounted to 75 cents or more per bushel.

Table 47. Year-to-year changes in prices received for sweet potatoes, Mississippi, 1910-54.

Size of change (cents per bushel)	No. years changes occurred			
	Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	4	8	12	12
5 - 19	8	7	15	27
20 - 39	6	5	11	38
40 - 69	2	1	3	41
70 or more	2	1	3	44
Total	22	22	44	

Greatest change: from 1951 to 1952 an increase of $1.72 per bushel.

The average price for sweet potatoes was within 20 cents per bushel of the average for the year before in 27 years of the 1910-54 period. In another 11 years the difference was between 20 and 40 cents per bushel. In 3 of the 44 years the difference was 70 cents or more per bushel.

Table 48. Year-to-year changes in prices received for turkeys, Mississippi, 1912-54.

Size of change (cents per pound)	No. years changes occurred Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 1.0	4	7	11	11
1.0 - 2.9	12	5	17	28
3.0 - 4.9	7	5	12	40
5.0 or more	1	1	2	42
Total	24	18	42	

Greatest change: from 1929 to 1930 a decrease of 6.7 cents per pound.

Turkey prices averaged within 3 cents per pound of the average for the year before in 28 years of the period 1912-54. The change from one year to the next exceeded 5 cents per pound in only 2 years of the 42-year period.

Table 49. Year-to-year changes in prices received for wool, Mississippi, 1910-54.

Size of change (cents per pound)	No. years changes occurred Increases over previous year	Decreases from previous year	Total number years	Cumulative total number years
Less than 5	12	8	24*	24
5 - 9	9	5	14	38
10 - 14	2	2	4	42
15 or more	1	1	2	44
Total	24	16	44	

Greatest change: from 1950 to 1951 an increase of 38 cents per pound.

*No change 4 years.

Average prices for wool varied from the average of the year before by less than 5 cents per pound in 24 years out of a total of 44 and by less than 10 cents in 38 years. In 2 years of the 1910-54 period prices for the year differed by more than 15 cents per pound from the average for the year before.

Table 50. Variations in annual prices of farm commodities, Mississippi, 1910-54.

Commodity	Unit	Average price	Standard deviation	Coefficient of variation
Beef cattle	$	6.95	5.31	76.46
Calves	$	9.24	6.57	71.15
Milk cows	$	57.99	39.39	67.92
Sweet potatoes	$	1.44	.92	63.68
Lambs	$	9.34	5.42	58.05
Hogs	$	10.22	5.53	51.46
Cotton	¢	19.72	9.59	48.63
Wool	¢	31.58	14.58	46.17
Sheep	$	5.45	2.36	43.32
Hay	$	15.93	6.61	41.51
Milk	$	2.94	1.16	39.39
Corn	$	1.14	.44	38.57
Butterfat	¢	37.84	14.60	38.51
Eggs	¢	29.18	10.90	37.46
Potatoes	$	1.60	.59	36.56
Turkeys	¢	24.44*	8.85	36.21
Chickens	¢	19.35	6.32	32.69
Cottonseed	$	63.91	19.64	30.72
Oats	$	.75	.22	30.00
Soybeans	$	2.34**	.60	25.56
All commodities	Index	159.07	66.26	41.65

*1912-54 average.

**1913-54 average.

The twenty commodities listed above are listed in order of variability in prices as measured by the coefficient of variation. According to this measure prices of beef cattle have been the most variable for the 1910-54 period and soybeans the least variable. This measure should be used, however, to study variability over long time periods only. See Tables 30-49 for year-to-year price changes.

Table 51. Index numbers of the average seasonal variation in prices of farm commodities, (Mississippi, 1946-54.)

Commodity	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Crops:												
Cotton	95.8	95.5	98.5	101.4	100.9	101.0	101.5	101.8	104.1	101.6	99.2	98.7
Cottonseed	106.5	102.8	100.0	104.4	103.7	100.5	98.4	93.8	91.9	94.5	101.7	104.4
Corn	93.3	98.0	99.6	101.6	104.1	104.1	104.8	106.8	103.6	94.1	93.4	96.6
Oats	103.2	101.0	102.7	103.4	102.5	90.8	90.4	93.5	99.4	102.4	107.3	103.4
Hay	102.1	104.7	104.6	104.1	99.6	97.9	97.5	97.2	95.1	96.5	100.0	100.7
Soybeans	97.5	101.5	104.9	111.4	114.9	107.2	104.2	98.3	89.6	87.3	89.7	93.5
Potatoes	104.6	107.3	110.7	110.5	89.6	78.3	88.1	97.2	103.9	102.5	101.3	106.0
Sweet Potatoes	92.9	98.0	101.1	102.5	104.4	103.5	103.8	122.4	106.3	93.7	83.8	87.6
Livestock:												
Milk	110.1	105.6	97.5	89.2	87.8	87.2	88.9	92.9	101.7	109.2	115.0	114.9
Butterfat	103.5	101.7	99.4	98.1	96.6	97.6	97.2	97.6	99.9	101.3	103.3	103.8
Beef Cattle	101.6	101.0	104.2	104.8	105.3	101.2	101.6	98.9	96.1	94.8	95.0	95.5
Calves	100.4	99.2	104.1	105.2	105.5	103.0	102.0	99.1	97.8	93.7	94.2	95.8
Hogs	96.3	92.4	95.2	94.8	98.8	101.6	107.3	109.4	106.1	103.7	98.5	95.9
Chickens	98.9	98.0	101.1	101.3	99.9	99.3	102.8	102.2	102.3	98.3	96.2	99.7
Eggs	112.3	93.0	77.6	75.4	79.2	81.8	89.4	99.6	112.6	120.6	125.7	132.8
Turkeys	105.4	100.3	99.6	98.2	96.8	98.0	96.1	97.3	100.6	98.3	103.3	106.1
Sheep	97.6	100.4	105.0	102.5	104.7	101.6	99.7	99.8	97.8	96.8	97.9	96.2
Lambs	98.5	97.8	101.3	100.4	102.6	102.8	104.4	99.7	96.2	95.1	96.4	104.8
Wool	99.8	98.7	97.5	100.8	101.8	101.8	100.8	101.9	100.8	98.8	99.0	98.3
Milk Cows	100.2	99.3	103.8	102.8	101.6	98.7	98.7	98.7	98.3	98.8	98.9	100.2

The best time to have some commodity ready for market is not always at the time when prices are usually the highest. If the commodity is a storable commodity, a cost for storage is usually involved in carrying the commodity forward. If the commodity is perishable or semi-perishable, extra costs of production and/or lower yields are usually involved. However, the above information regarding seasonal price movements should be an aid in determining the best time to have some commodity ready for market.

Table 52. A comparison of the high and low average monthly prices of farm commodities, (Mississippi, 1946-54.)

Commodity	Low month		High month		Percentage increase from low to high month
	Month	Percent of average annual price	Month	Percent of average annual price	
Eggs	Apr.	75.4	Dec.	132.8	76
Sweet potatoes	Nov.	83.8	Aug.	122.4	46
Potatoes	June	78.3	Mar.	110.7	41
Soybeans	Oct.	87.3	May	114.9	32
Milk	June	87.2	Nov.	115.0	32
Oats	July	90.4	Nov.	107.3	19
Hogs	Feb.	92.4	Aug.	109.4	18
Cottonseed	Sept.	91.9	Jan.	106.5	16
Corn	Jan.	93.3	Aug.	106.8	14
Calves	Oct.	93.7	May	105.5	13
Beef cattle	Oct.	94.8	May	105.3	11
Hay	Sept.	95.1	Feb.	104.7	10
Turkeys	July	96.1	Dec.	106.1	10
Lambs	Oct.	95.1	Dec.	104.8	10
Cotton	Feb.	95.5	Sept.	104.1	9
Sheep	Dec.	96.2	Mar.	105.0	9
Butterfat	May	96.6	Dec.	103.8	7
Chickens	Nov.	96.2	July	102.8	7
Milk cows	Sept.	98.3	Mar.	103.8	6
Wool	Mar.	97.5	Aug.	101.9	5

The commodities in the table above are listed in order of variability in prices within years for the period 1946-54. This period was used instead of the entire period 1910-54 because of changes in seasonal movements of prices during the longer period. Egg prices are by far the most variable within years, increasing on the average by 76 percent from the low month to the high month. Prices of sweet potatoes, the next most variable, increased on the average only by 46 percent from the low month to the high month. Wool prices were most stable within a given year of all the commodities listed above.

Table 53. Computation of price relatives and the index number of prices received by farmers for March, 1954.

Commodity	Unit	Average price 1910 - 14 (1)	Price March 1954 (2)	Price relative* March 1954 (3)	Weights (4)	Col. (3) X Col. (4) (5)
Cotton	¢	12.1	34.1	282	60.43	17,041
Beef cattle	$	3.66	10.30	281	9.34	2,625
Cottonseed	$	22.83	64.00	280	8.44	2,363
Milk	$	2.25	4.20	187	7.24	1,354
Hogs	$	6.51	14.90	229	3.92	898
Chickens	¢	12.0	28.6	238	3.27	778
Eggs	¢	18.7	36.0	193	3.01	581
Corn	$	.81	1.54	190	1.48	281
Rice	$	1.81	4.05	224	1.07	240
Soybeans	$	1.77	2.70	153	.72	110
Sweet potatoes	$	.77	3.35	435	.56	244
Oats	$	.63	.95	151	.52	79
Total					100.00	26,594
Index number for March**						266

*$\frac{\text{Column (2)}}{\text{Column (1)}}$ X 100.

**Total of column (5) divided by 100.

Table 54. Calculations of weights used in computing index number of prices received by farmers, Mississippi.

Commodity[1]	Average cash farm income 1945 - 49 (1)	Weights 1910 - 50[4] (2)	Weights 1951 - 55[5] (3)
	(1,000 dollars)		
Cotton	245,400	61.09	60.43
Cattle and calves[2]	37,911	9.44	9.34
Cottonseed	34,270	8.53	8.44
Dairy products[2]	29,397	7.32	7.24
Hogs	15,939	3.97	3.92
Chickens	13,272	3.30	3.27
Eggs	12,231	3.04	3.01
Corn	6,012	1.50	1.48
Soybeans	2,919	.73	.72
Sweet potatoes	2,260	.56	.56
Oats	2,102	.52	.52
Rice	4,357[3]	.00	1.07
Total	406,070		100.00
Total not including rice	401.713	100.00	

[1] These commodities made up 93.07 percent of the total cash farm receipts for 1945-49.

[2] Weights calculated for cattle and calves and for dairy products were used for milk and beef cattle, respectively.

[3] Average for 1950-53.

[4] Obtained by dividing each figure in column (1) by 401,713 and multiplying the result by 100.

[5] Obtained by dividing each figure in column (1) by 406,070 and multiplying the result by 100.

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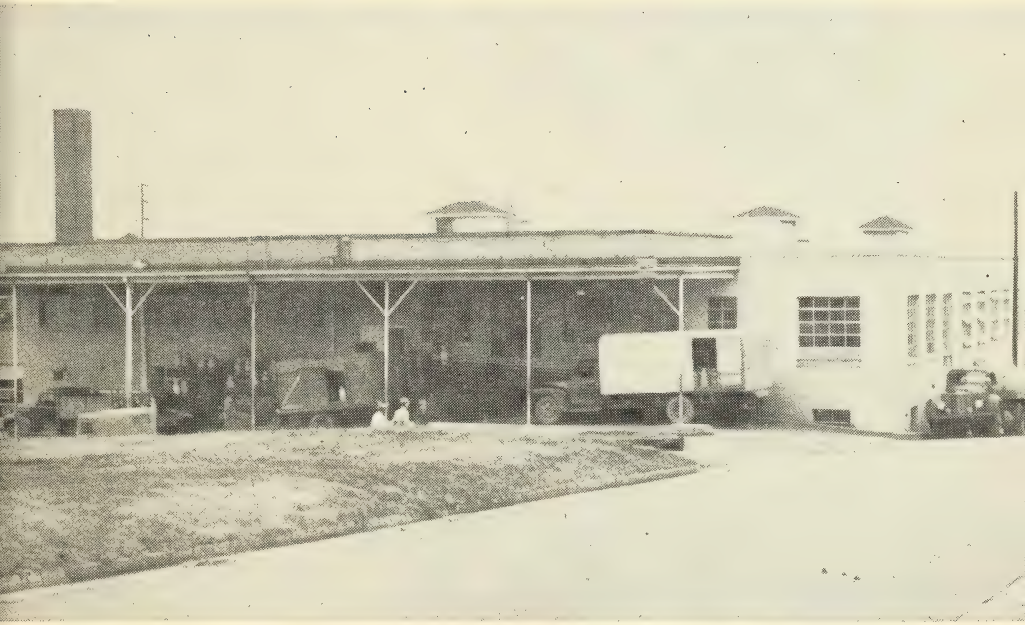
Cost and Efficiency Of Selected Mississippi Fluid Milk Plants



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This publication reports on a Mississippi phase of the Southern Regional Milk marketing project SM-10 which was financed in part from Title I 9(b) 1 and 2 and 9(b) 3 funds made available under provisions of the Research and Marketing Act of 1946.

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Cost and Efficiency of Selected Mississippi Fluid Milk Plants

By

VERNER G. HURT

INTRODUCTION

Combined sales of butter, cream, and milk by Mississippi farmers in 1954 totaled 981 million pounds of 4 percent milk equivalent and returned 44.7 million dollars.[1] These sales represented an increase over the average of the period 1935 through 1939 of 71 percent in volume marketed and 327 percent in cash income.[2] The fluid milk division of the industry has also expanded greatly. Information obtained concerning 36 fluid pasteurizing plants by interview in the summer of 1949 showed that 58 percent of these firms had been established within the ten-year period, 1939-1948.[3]

The Problem

The varied and complex problems which frequently accompany rapid growth in any industry are asserting themselves in the case of Mississippi fluid milk. These problems have led to some unrest and agitation in recent years among the various economic groups directly connected with the dairy industry. While steps have been taken to resolve some of the differences, and certainly to solve some of their problems, the task has been by no means completed.

Considerable concern has been expressed by many persons about the possibilities of improving the efficiency of the marketing system as a means of solving some of the problems which face the industry. Any attempt to improve the efficiency of the marketing system for fluid milk by an attack upon the entire system would be a gigantic and possibly an insurmountable task. However, if research were attempted on specific segments separately, accomplishment of the objectives can be foreseen.

Prior research in Mississippi has been concerned with the supply of utilization of fluid grade milk.[4] Also, research has been conducted on the types of pricing plans and their effects on the seasonality of milk production.[5] An examination of available materials indicated that the next major area of study should be on operating costs of distributing plants. While a limited amount of research relating to this has been accomplished in the North Central and the New England states, the field has not been opened in Mississippi and only to a very limited extent in the Southern Region. However, commercial accounting firms have done some very useful work.[6] While results from research performed in the Northern states are quite adequate for that area, it appears necessary to develop information specifically applicable to the Mississippi industry. This necessity is due to variations which exist in certain cost items, for example, labor.

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[1] United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board; **Farm Production, Disposition, and Income from Milk, 1953-1954.** (Washington, D. C., April, 1955.) Table 11, p. 16. (Preliminary).

[2] United States Department of Agriculture, Bureau of Agricultural Economics, **Farm Production, Disposition, and Income from Milk, 1935, 1939.** (Washington, D. C., April, 1942), pp. 31-47.

[3] Garbarino, A. J., **Marketing of Fluid Milk in Mississippi,** A Thesis, Mississippi State College, January, 1950, Table 1, Page 10.

[4] Jenkins, L. P. and Moffett, W. W., Jr., **Supply and Utilization of Fluid Grade Milk in Selected Mississippi Markets, 1950 and 1951.** Mississippi Agricultural Experiment Station Technical Bulletin No. 39, September, 1953.

[5] Jenkins, L. P. and Moffett, W. W., Jr., **A Study of Fluid Milk Pricing Plans in Mississippi and Their Effect on Seasonality of Production.** Mississippi Agricultural Experiment Station Technical Bulletin No. 38, August, 1953.

[6] For example, the work by the Edward B. McClain Company, Memphis Tennessee.

Objectives

This project was initiated in order to determine the costs and efficiencies of handling and processing fluid milk from the time it leaves the farmers' hands until it is deposited on the consumer's doorstep or is placed in the retail store. Specifically, the objectives were:

(1) To determine whether or not there are economies to scale of operation.

(2) To study input-output relations among costs of performing the various functions, such as (a) costs of administration, (b) costs of processing by departments, and (c) costs of distribution.

(3) To evaluate labor efficiency and other major cost items as they relate to costs of operation.

(4) To develop some basis and to suggest alternatives whereby fluid milk processors can make decisions aimed at reducing costs in all phases of operation.

Scope of Study

Twelve fluid milk plants handling from 2,716 to 43,008 quarts of producer milk daily were selected for this study. The type of operation of these plants was predominantly that of receiving, processing and distributing fluid milk. However, often-times facilities were available for the handling of milk received which constituted a surplus over that amount required to fulfill the fluid demand. Of the plants studied, Figure 1, one utilized the milk received from producers in a paper-filling operation only, three had paper- and glass-filling operations, three had paper-filling and ice cream operations, two had paper- and glass-filling and condensery operations, two had paper- and glass-filling and ice cream operations, and one had paper- and glass-filling, ice cream, and condensery operations. The bottling costs were isolated from the ice cream and condensery costs in order to keep the analysis restricted to the bottling phase. Eight of the plants studied processed their products in both paper and glass, and four had only a paper operation, Figure 1. The analyses have been designed to determine the unit costs of handling for those products in paper and those in glass.

Procedure

The fluid milk plants which are included in this study were selected on the basis of (1) size and type of operation, (2) geographical location, (3) type of records available, and (4) influence on other plants within the state. Data were obtained by interviews with plant managers, accountants, and clerical workers, from accounting records, and from observation of the specific operations within each plant. The information included methods of allocating costs within each plant. Also, certain cost categories, which were not readily available, were derived with the help of plant personnel. This information was gathered in 1953 and 1954 for the previous year's operation.

Plant records yielded information pertaining to actual costs of operating the business, volume of milk handled and utilized in different types of operations, plant inventories, and the amount and types of equipment in operation.

A basis for allocating certain costs was acquired from personal observation of the functional operation of each plant. Detailed information relative to the procedure for collecting data and allocating costs to the various functions and departments can be found in Appendix A.

Limitations of Data

This study was designed to include plants of different sizes. Originally the basis for the assignment of each plant to a specific size group was its average daily receipts of fluid milk from producers for the year. Four size groups were planned at first, however, difficulties encountered in processing the data necessitated the assignment of plants to size groups on the basis of volume of milk utilized by each function and department.

The data collected reflected the act-

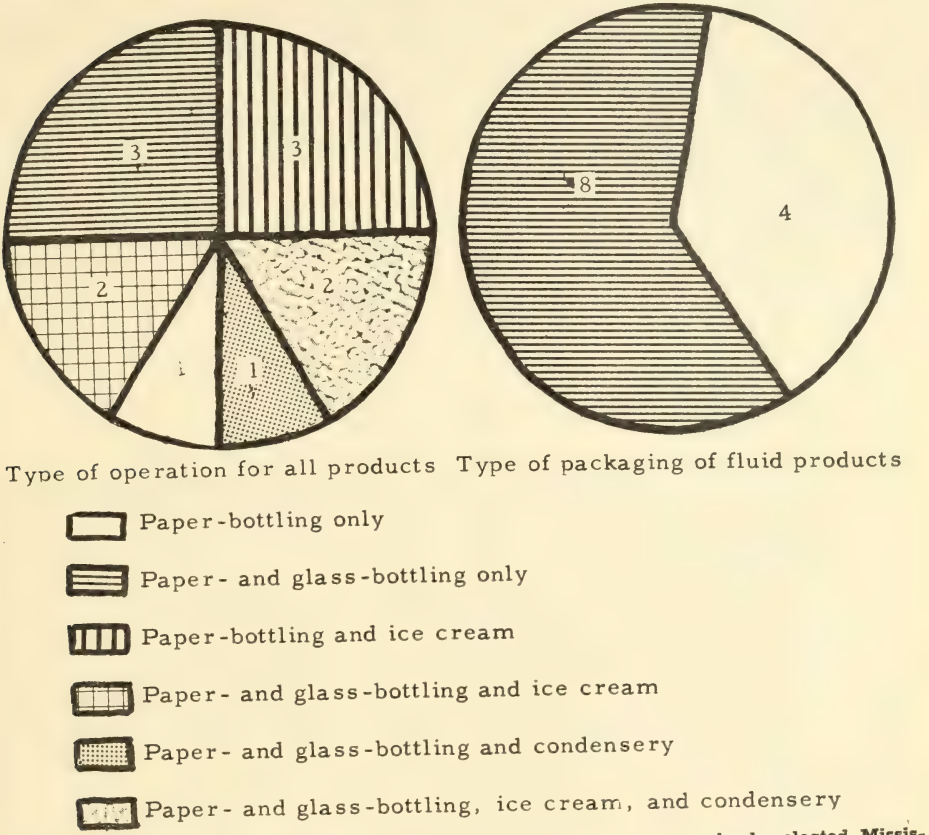

Figure 1. Classification according to method of utilizing all milk received, selected Mississippi fluid milk plants, 1952-54.

ual costs to the plants as determined from their accounting records. In the analysis these costs were not adjusted to put the plants on a comparable basis.[7] Only those procedures necessary for the allocation of the costs to functions and departments and the determination of costs per unit were utilized.

This study was designed primarily to determine in detail the costs of the processing function. Hence, the costs which have been determined for the administrative and distributive functions were not as detailed as those for processing. Also, the administrative and distributive costs which have been determined may not be as representative of the costs that existed within the plants as are the processing costs. This lack of representativeness was due primarily to methods of allocating managerial salaries and to the proportion of the product sold as retail, wholesale, or platform sales.

The sample was not designed to be representative of all Mississippi plants. Therefore, the generalizations and deductions made in the analyses would be applicable only to the selected plants, or to plants having like characteristics in most respects to those studied.

---

[7] For example, original costs of equipment and depreciation rates were not adjusted to a common or uniform base.

ANALYSIS OF OPERATING COSTS

Basic Concepts

It seems desirable to set forth some of the basic concepts of the individual firm and the industry within which this firm is operating, before attempting to analyze the relationship existing between cost per unit and daily volume for the various departments of the fluid milk plants studied. Only the theory relative to the characteristics of average total costs for the firm and for the industry will be mentioned, since this is the segment of the theory upon which the forthcoming analysis is based.

In each individual firm, unit costs would be expected to be high for a small volume of output. These costs would be expected to decrease as output increased until the most efficient size of operation was reached, and then to increase again as the organization of the firm became more complex and unmanageable.[8] These characteristics are presented graphically in Figure 2. Firm A, designed to handle a specified volume of products will have a certain point at which the average total cost is lowest. (Using per unit cost of production as the criterion, this point will represent the optimum size and cost. However, the optimum size and cost may vary under certain short-run situations and when profit maximization is the criterion.[9]) At any volume more or less than that at which the optimum cost is attained, the average total cost would be expected to be higher. Assuming that there exist within the dairy industry other firms which were designed to handle larger and smaller volumes than Firm A, their average costs would be illustrated by the same characteristic U-shaped curve as is shown in Figure 2. However, for those firms designed for a higher volume than Firm A, their optimum point of operation would be at a higher average cost and volume than Firm A's, providing that Firm A's design was such that it represented the most efficient size for the industry. In such a case, for those firms designed for a lower volume range than was Firm A, their optimum point would be at a lesser volume and higher cost than Firm A.

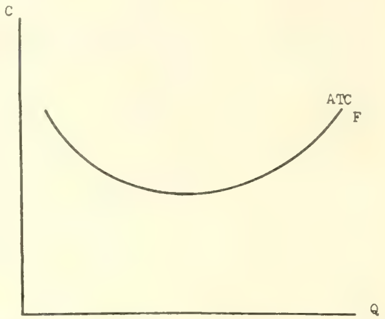

Figure 2. Theoretical concept of average total costs for the individual firm.

The average total costs for the industry woulld be illustrated by the characteristic U-shaped curve as was the case for the firm, Figure 3. However, the volume for the industry would be many times that for the individual firm.

All of the variability of unit costs that has been found in the Mississippi fluid milk plants cannot be attributed to pure-scale relationships or to the indivisibility of resources. Some of this variability must be explained by differences in the proportions with which various resources are combined.

In the analysis which follows an attempt will be made to point out the relationship that exists, in the firms studied, between unit costs and volume of operations. Also, observations relative to the causes of variations in certain of the costs will be given. No attempt has been made to develop average total cost curves for the firm or for the industry.

In attempting to determine the relationship existing between unit costs and volume, mathematical curves using

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[8] Nicholls, William H., **A Theoretical Analysis of Imperfect Competition With Special Application to the Agricultural Industries,** Ames, Iowa, The Iowa State College Press, 1947, p. 28.

[9] Heady, Earl O., **Economics of Agricultural Production and Resources Use,** New York, Prentice-Hall, Inc., 1952, p. 361.

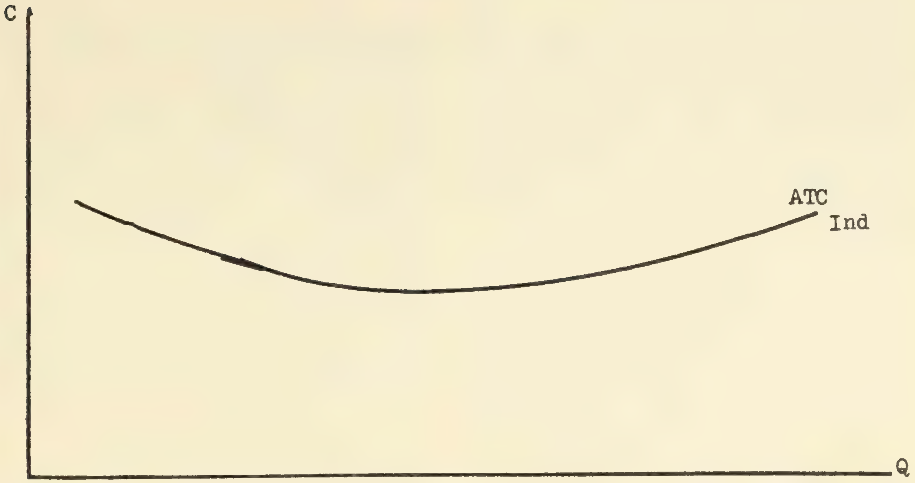

Figure 3. Theoretical concept of average total costs for the industry.

logarithms in the independent variable were fitted to the data for various functions and departments[10] of the plants studied. This logarithmic regression was chosen on the assumption that as volume of output increased, unit costs decreased, but at a decreasing rate. It is also assumed that the volume of operations of the largest plant included in the study was not sufficient to have encountered unfavorable economic results.

In addition to presenting the relationship between unit costs and daily volume, averages of the costs per unit of the various functions, departments, and cost categories, for the plants studied are shown. These average costs have been developed as a model to provide a basis for cost-reducing decisions by plant operators. In using the model, it must be remembered that the average costs are not representative of the optimum costs for the plants studied. A plant would not be considered efficient necessarily, if it were operating with the same costs as those of the model. The above is not meant to imply that the model costs may not be representative of the optimum for some volume of operations. It does mean that there are possibilities for costs lower than those of the model.

Administrative Costs

Costs of administration were separated into two categories, (1) salary costs, and (2) other costs. Salary costs included the wages paid administrative personnel, such as, general managers, office workers, and plant superintendents. Other costs consisted of office supplies, floor space utilized, office equipment, communications, and certain general expenses.

Salary costs

Salary costs per unit would be expected to vary among plants according to the size of the operation, type of records maintained, and the wage rate paid. Plants with larger volumes would be expected to have lower salary costs per unit due to the indivisible nature of the management resource. Decreases (with certain discontinuities) in the unit costs of clerical salaries would be expected from increases in volume. However, the use of more complex control records to supplement the management factor as the operation became larger and more complicated would slow the rate of decrease in unit costs in the larger operations. As a general rule, a plant with a large volume could justify complex records, while a smaller plant could not.

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[10] See Appendix A for what constitutes a function and/or a department.

The practice, in some cases, was for owner-operators to draw a monthly salary just sufficient to meet their living expenses. Thus, the remainder of the returns to management accrued as business earnings. This practice would lead to an expectation of lower salary costs per unit for owner-operated plants than for those which were manager-operated.

The cost of salaries per 1,000 quart units, as developed for the model, was a simple average of the unit costs of eleven of the plants studied. One plant was not included because it was not possible to separate office salaries from other costs. The model cost, as shown in Table 1, was $6.20. Costs among plants ranged from $2.50 to $10.41. Plants which were efficient in the utilization of administrative labor would have had lower than the average costs per unit. Costs of inefficient plants would have been higher. Still, a plant might justify temporary inefficiency, if its administrative organization was too complex for the present volume of operations. This would be true if the operations were expected to expand in the near future to a volume requiring such a complex organization.

Table 1. Average cost of administration per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.*

Cost category	Pct. of total	Avg. cost	Cost range	
			Low	High
Salaries	64.2	$6.203	$2.505	$10.408
Other	35.8	3.461	1.085	7.290
Total	100.0	9.664	**4.221	**15.671

*Average of eleven plants.

**Does not agree with sum of column since the cost for some plant's may be high or low for one category, while different plants have the highest or lowest total cost.

Variations in salary costs per unit among plants indicate opportunities for reducing this item. Whether these opportunities were as large as indicated by the data would depend on, among other things, whether or not the lower costs would maintain sufficient records. Also, the monthly salaries which some of the owner-operators were drawing for their services would not be sufficient to obtain managers with comparable qualifications.

The effect of lower salaries on the ability to obtain or retain capable administrative personnel, particularly for management, should not be ignored when attempting to lower costs. Possibly, lower salaries would be reflected in inefficiencies in other phases of the operation. However, in the plants studied it was not evident that lower salary costs resulted in inefficiencies in other phases of the operation. This finding may have been due to the lower costs for plants having owner-operators. Thus, it appears that actual salaries did not reflect the incentive for efficient organization or the volume of the managers' capabilities.

Other administrative costs

Certain factors lead to an expectation of variation in other costs per unit among plants. Difference in the type of records maintained, as they affected the cost of office supplies, would be expected to account for some of the variation. Also, the more complex records would be expected to result in a higher cost for supplies. In addition, differences in office machinery required for the various records would be expected to influence costs. The indivisible nature of the office equipment resources, indicates that certain economics would be expected from the larger operations. Thus, variations due to differences in the size of the operations would cause variations in other costs. Differences in the cost of office space would be expected to cause some variations. These variations would be due to differences in the amount of floor space utilized. Also, differences in the original cost of the building, and the depreciation rates, as they affected building expenses, would be expected to cause variations in costs. If the building were rented, differences in rental charges would affect variations in costs.

Only eleven plants were used to determine the average of other costs. The omission of one plant was necessary because office salaries were included in other costs. The average of other costs per 1,000 quart units, Table 1, was $3.46. Costs among plants ranged from $1.08 to $7.29. The range of costs indicates opportunities for operating at lower costs.

A decrease in the cost of office space per unit might be effected by either reorganization of the office requirements, or an increase in the volume of output. Elimination of unnecessary records and forms should lead to a reduction in the cost of office supplies. Also, alterations in the type of records maintained could lead to lower equipment costs by eliminating the necessity for certain items of equipment. However, adequate records should not be sacrificed for lower unit costs. Adjustment of the utilization of office space would be of a long-run nature, while changes in records could be accomplished in the short-run.

Total administrative costs

In summary, salary cost and other cost determined the average total administrative cost. Thus, causes of expected variations in total administrative costs among plants would be the same as those mentioned above. Also, the previous discussion of opportunities for reducing costs of the categories would be applicable to the total administrative cost.

Total administration cost per 1,000 quart units, as shown in Table 1, was $9.66. Salary and other administrative costs accounted for 64 and 36 percent, respectively, of the total. Costs among plants ranged from $4.22 to $15.67.

When unit costs were related to daily volumes, the relationships shown in Figures 4 and 5 were found. However, only 7 percent of the variations in cost per unit among plants was attributable to differences in volume of output per day in quart units.

Processing Costs

Certain characteristics of the cost categories of the processing function lead to an expectation of variations in unit costs of processing among the plants. Some of these variations in unit costs were due to the cost of the resources and were not susceptible to any appreciable change by plant managers. Other variations were due to differences in the proportion in which the resources were combined and were susceptible to change by plant managers. First to be discussed will be those variations attributable to differences in the cost of the resources. This will be followed by an analysis of the variations due to differences in the proportions in which the resources were combined. The following discussion will be applicable to each of the departments of the processing function in which the particular cost categories were utilized.

Variations in unit costs of the departments due to the cost of the resources were evident in certain of the cost categories. Differences in the original costs and the depreciation rates for buildings and equipment gave rise to variations in their cost per unit among plants. Differences in the cost

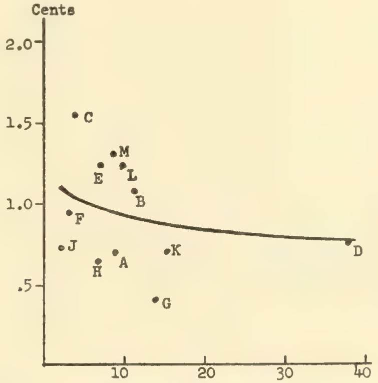

Figure 4. Relationship existing between daily volume and administration costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

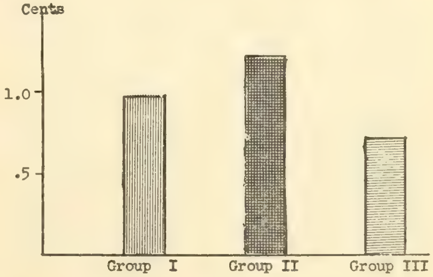

Figure 5. Average cost of administration per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

of the floor space assigned to each department resulted in variations in building costs. Variations in labor costs per unit were caused by differences in wage rates. Differences in the amount and type of general supplies used caused some variations. The volume of product handled by each plant in which they were utilized may have caused variations in the unit cost of manufacturing supplies. If electricity rates differed among plants, variations in unit costs would be expected from this source. Since some plants had their own water supply while others purchased theirs from outside sources, variations from differences in water costs were also expected.

Ordinarily, variations among plants in unit costs of the processing department would be expected which may have been the results also of differences in the proportion in which the resources or cost categories were combined. The variations expected from each of the cost categories will be the content of the following analyses.

Variations among plants might arise from differences in the amount of floor space required per unit of output. Usually, plants with a large volume of output should have lower costs for floor space per unit than those with smaller operations. The requirements for floor space would not be expected to vary appreciably even though volume changed. If an increase in floor space requirements were necessary for an increased volume, the allocation of the total to each unit of output should be less than was required originally.

Labor costs per unit, due primarily to the indivisible nature of this resource, should vary among plants. Also, differences among plants in the relative efficiency and the degree of utilization of this resource might have resulted in variations in labor costs per unit. In addition to the above, differences in the assembly and clean-up time required per unit could have caused variations. As volume increased, assembly and clean-up time per unit would probably decrease. Another source of variations among plants in labor costs per unit might have been the relative proportion of different products and the containers of various sizes utilized in each of the plants. The time required to change from one product to another or to change container sizes may have caused variations in the labor cost per unit.

Variations in departmental costs among plants attributable to the equipment resource might have been the result of volume of operation varying among plants. Other variations may have been due to the size, type, and amount of equipment utilized. The indivisible nature of the equipment resource could have been responsible for other variations. Generally, equipment costs per unit for the larger plants would tend to be less than those for the smaller operations.

Variations in departmental costs for general supplies, mostly cleaning agents, would depend upon the volume of output and the relative efficiency with which such supplies were utilized. Since assembly and clean-up time per unit should decrease when volume is increased, costs per unit for general supplies should decrease with an increase in output.

The utilization of containers of different sizes and the proportion in which the different sizes were utilized may have caused variations among plants in costs per unit. Differences in bottle breakage and closure costs, as influenced by the type and size of container used, could have caused variations. Variations attributable to paper container costs would be largely the result of differences in the size lot in which they were purchased.

The variations in unit costs among plants, attributable to the service departments, may have been due to differences in the utilization of certain resources. Fluctuations in building costs might have influenced dry storage costs per unit of output. Differences in the amount and type of fuel and the size and type of equipment used as they affected power plant costs per unit, may have caused a portion of the variations. Size and type of equipment also contributed to the differences in refrigeration cost per unit. Some of the plants maintained a separate repair and maintenance department, while others did not. This practice probably caused another part of the variations in the cost per unit of output.

Variations and their causes, mentioned above, were evident in each department where the particular cost category to which they were applicable was utilized. Therefore, in the following analysis of the processing function, these variations were responsible, to some extent, for the differences in the departmental costs among plants. If most of the variations in the departmental costs among plants were due to the factors mentioned above, then the opportunities for reducing unit costs would not have been as great as the cost range indicates. However, if most of the variations were due to differences in the combination of resources, then the cost range would more nearly reflect the opportunities which existed for lowering costs.

Receiving and bulk storage costs

The first department which the milk reached when it arrived at the plant and was unloaded from the truck or the tank truck, was the receiving and bulk storage department. The costs included in this department were those of receiving, sampling, dumping, weighing, cooling, and storing of the bulk milk. Also included was the cost of washing the cans in which the milk was shipped to the plant and the laboratory costs.

The type of container in which the product was packaged usually would not affect the unit costs of this department. Therefore, all plants studied were included when the model costs were determined. The cost of receiving and bulk storage, as shown in Table 2, was $3.51 per 1,000 quart units. Costs among plants ranged from $1.27 to $6.62. Labor was the highest single cost item averaging $1.25 and accounting for 36 percent of the total. Cost of labor, equipment, and general supplies made up 73 percent of the total.

Table 2. Average receiving and bulk storage costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Cost category	Average cost, dollars	Percent of total
Building	.314	8.9
Labor	1.247	35.5
Equipment	.712	20.3
General supplies	.616	17.5
Electricity and water	.127	3.6
Service department:		
Power plant	.194	5.5
Refrigeration	.185	5.3
Repair and maintenance	.118	3.4
Total	3.513	100.0
Cost range	$1.273 to $6.625	

Twenty-four percent of the variations among plants indicated by the cost range was attributable to differences in the daily volume of the plants. The relationship between unit costs and daily volume is shown in Figures 6 and 7.

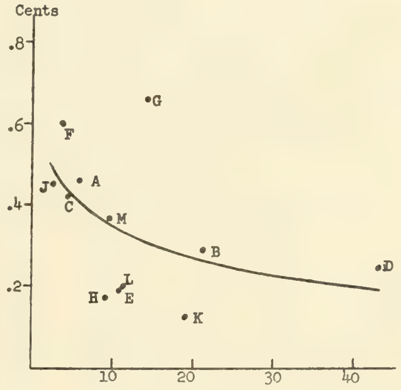

Figure 6. Relationship existing between daily volume and receiving and bulk storage costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

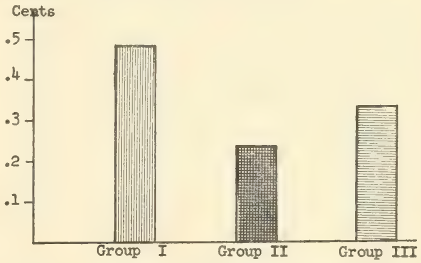

Figure 7. Average cost of receiving and bulk storage per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

Clarification, Standardization, and Pasteurization Costs

The second department through which the milk passes during processing has been designated as clarification, standardization, and pasteurization. This department included the operations signified by its title, plus those of product preparation, such as the making of buttermilk and chocolate milk. All of the operations required to move the milk from the storage tanks to the filling machines, other than homogenization, were included in this department. In most plants the milk was clarified prior to entering the bulk storage tanks. In order to simplify the handling of costs, this operation has been included in this department for purposes of analysis.

The type of container in which the product was packaged did not influence the costs of this department. Hence, all plants studied were included in determining an average of unit costs for the model. The average of total costs for this department per 1,000 quart units, Table 3, was $6.82. Costs among plants ranged from $3.49 to $13.75. Equipment was the highest single cost item, averaging $1.81, and accounting for 26 5 percent of the total. Costs per 1,000 quart units for labor, equipment, manufacturing supplies, and general supplies were $5.68. These costs accounted for 83 percent of the total.

Table 3. Average clarification, standardization, and pasteurization costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Cost category	Average cost, dollars	Percent of total
Building	.285	4.2
Labor	1.543	22.6
Equipment	1.806	26.5
Manufacturing supplies	1.545	22.6
General supplies	.788	11.5
Electricity and water	.257	3.8
Service department:		
Power plant	.400	5.9
Refrigeration	.102	1.5
Repair and maintenance	.097	1.4
Total	6.823	100.0
Cost range	$3.486 to $13.749	

Unit costs tended to decrease as daily volume increased, Figures 8 and 9. Fifty-two percent of the variations in unit costs among plants was attributed to differences in the daily volume.

Homogenization costs

If the milk product being processed was to be homogenized, the third department through which it passed was that of homogenization. The costs of this department were largely those of equipment, floor space, labor, and general supplies.

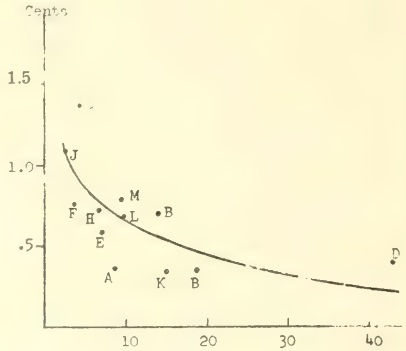

Figure 8. Relationship existing between daily volume and clarification, standardization, and pasteurization costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

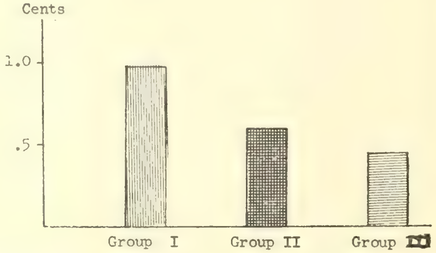

Figure 9. Average cost of clarification, standardization, and pasteurization per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

All plants studied were included when determining the average of the costs per unit for this department. The cost per 1,000 quart units was $1.22, Table 4. Costs among plants ranged

Table 4. Average homogenization costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Cost category	Average cost, dollars	Percent of total
Building	.036	3.0
Labor	.348	28.6
Equipment	.382	31.4
General supplies	.192	15.7
Electricity and water	.101	8.3
Service department:		
Power plant	.141	11.5
Repair and maintenance	.019	1.5
Total	1.219	100.0
Cost range	$.284 to $3.933	

from $.28 to $3.95. The highest single cost item was equipment, being $.38. The costs of labor, equipment, and general supplies averaged $.92 per 1,000 quart units, or 76 percent of the total.

Units costs tended to decrease as daily volume increased, Figures 10 and 11. Forty-five percent of the variations in costs among plants was attributable to differences in the daily volume handled.

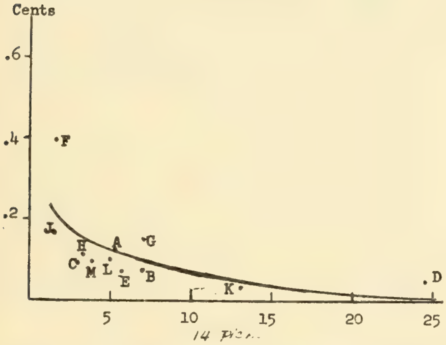

Figure 10. Relationship existing between daily volume and homogenization costs per quart unit, selected Mississippi fluid milk plants 1952-54.

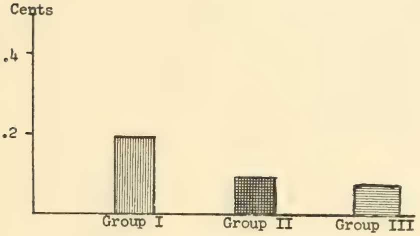

Figure 11. Average cost of homogenization per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

Glass-washing costs

The next department to be analyzed might be referred to as a service department, since it did not actually occupy a position in the flow of milk through the plants. However, for the purpose of facilitating the analysis, it was considered as a productive department in this study.

Only the plants which had a glass-bottling operation were included in determining this cost for the model. The average of the glass-washing costs per 1,000 quart units, as shown in Table 5, was $7.41. Labor was the highest single cost item averaging $3.15, and accounting for 42.5 percent of the total. Building, labor, equipment, and general supplies accounted for 88 percent of the total. Their cost was $6.52 per 1,000 quart units. Glass-washing costs among plants ranged from $2.85 to $14.02.

Table 5. Average glass-washing costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Cost category	Average cost, dollars	Percent of total
Building	1.024	13.2
Labor	3,147	42.5
Equipment	1.300	17.5
General supplies	1.051	14.2
Electricity and water	.192	2.6
Service department:		
Power plant	.339	4.6
Repair and maintenance	.357	4.8
Total	7.410	100.0
Cost range	$2.850 to $14.018	

In an attempt to explain some of the variations in unit costs by relating them to daily volume, it was found that unit costs tended to decrease as daily volume increased. However, only 4 percent of the variations in costs was attributable to differences in the daily volume.

Glass-filling costs

As the milk flow was followed through the plant, the fourth department which the homogenized product encountered, if it was to be packaged in glass, was the glass-filling department. The costs included in this department were those necessary to fill and close the containers, plus the cost of the containers and closures. The dry storage costs were also included and prorated to the glass operation on the basis of utilization.

The model costs for this department were derived by calculating the average of the costs of all plants studied which had a glass operation. The average of the glass-filling costs, as shown in Table 6, was $15.23 per 1,000 quart units. The highest single cost item was containers, amounting to $6.23 and accounting for 41 percent of the total. Labor, containers, and dry storage accounted for 79 percent of the total. Costs among plants ranged from $6.03 to $24.18.

Table 6. Average glass-filling costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.*

Cost category	Average cost, dollars	Percent of total
Building	.370	2.4
Labor	3.831	25.2
Equipment	.933	6.1
Container	6.232	40.9
General supplies	1.375	9.0
Electricity and water	.090	.6
Service department:		
Dry storage	1.926	12.7
Repair and maintenance	.474	3.1
Total	15.231	100.0
Cost range	$6.030 to $24.178	

*Includes only those plants having a glass operation.

The relationship between unit costs and daily volume for this department was determined with the cost of containers excluded. Then the relationship between container costs and volume was calculated. Glass-filling costs per unit, exclusive of the cost of containers, tended to decrease as daily volume increased, Figures 12 and 13. Fifteen percent of the variations in unit costs among plants was attributed to volume differences in this relationship. Glass-container costs per unit decreased slightly as daily volume increased, Figures 14 and 15. Differences in the daily volume accounted for only 2 percent of the variations in glass-container costs among plants.

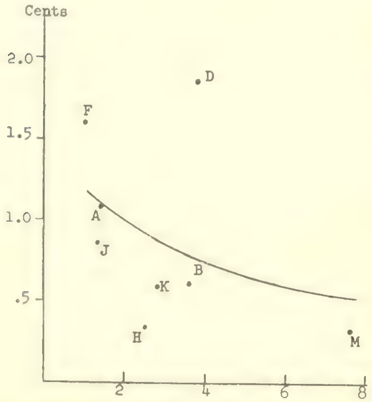

Figure 12. Relationship existing between daily volume and glass-filling costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

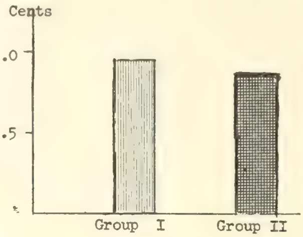

Figure 13. Average cost of glass-filling per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

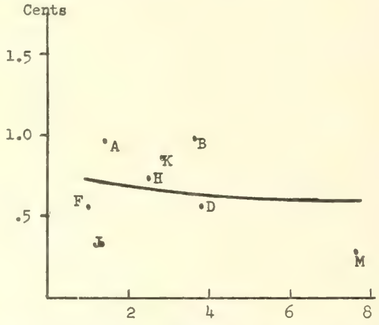

Figure 14. Relationship existing between daily volume and glass-container costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

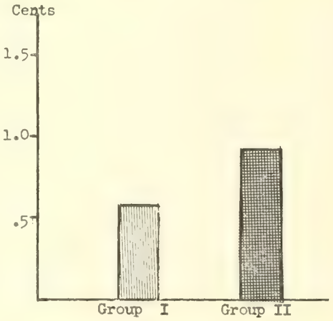

Figure 15. Average cost of glass containers per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

Paper-filling costs

The paper-filling department was the fourth department through which those products passed which were homogenized and packaged in paper. Costs of this department were considered to be those necessary to package the product in the paper container. Included were the costs of the floor space, labor, equipment rental, utilities, and the container and related supplies such as wire, wax, and glue.

Eleven of the plants studied used similar paper-filling machines. The machine in the other plant was substantially different. Therefore, in deriving the model costs, only the eleven similar plants were considered.

The average costs of the paper-filling department, as shown in Table 7, was $24.51 per 1,000 quart units. Costs among plants ranged from $19.99 to $29.18. The highest single cost item was for containers, amounting to $16.57 and accounting for 68 percent of the total. The cost of labor, equipment, and general supplies accounted for another 26 percent of the total. Their cost was $6.42 per 1,000 quart units.

Table 7. Average paper-filling costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.*

Cost category	Average cost, dollars	Percent of total
Building	.333	1.4
Labor	2.169	8.8
Equipment	3.397	13.9
Container	16.568	67.6
General supplies	.855	3.5
Electricity and water	.085	.3
Service department:		
Dry storage	.881	2.8
Power plant	.077	.3
Refrigeration	.196	.8
Repair and maintenance	.150	.6
Total	24.511	100.0
Cost range	$19.990 to $29.177	

*Eleven of the plants studied which had similar paper operations.

Container costs were separated from the remainder of the paper-filling costs when the relationship was determined between units costs and daily volume. Paper-filling costs, exclusive of the cost of the containers, tended to decrease as daily volume increased, Figures 16 and 17. Forty-eight percent of the variations in these unit costs was attributed to differences in the daily volume in this relationship. Container cost usually decreased as daily volume increased, Figures 18 and 19. However, only 20 percent of the variations among plants in unit costs was attributable to differences in the daily volumes.

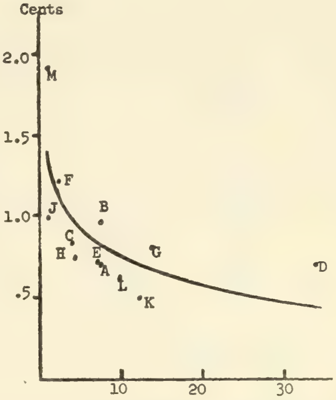

Figure 16. Relationship existing between daily volume and paper-filling costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

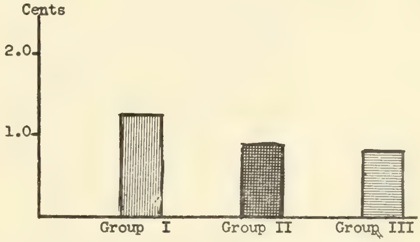

Figure 17. Average cost of paper-filling per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

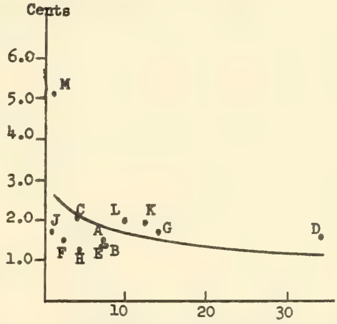

Figure 18. Relationship existing between daily volume and paper-container costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

Cold storage costs

The final department in the processing function was the cold storage department. The costs of this department were considered to be mostly those of

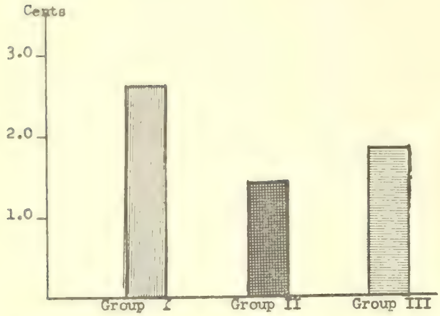

Figure 19. Average cost of paper containers per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

floor space, labor, general supplies, and refrigeration.

The cold storage department was operated essentially the same, regardless of the product or package. Therefore, all plants studied were used to determine the model costs. The average cost of the cold storage department was $1.79 per 1,000 quart units, Table 8. Costs among plants ranged from $1.16 to $2.71. Refrigeration was the highest single cost item, amounting to $.84 and accounting for 47 percent of the total. The costs of building and of labor accounted for another 39 percent of the total.

Table 8. Average cold storage costs per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Cost category	Average cost, dollars	Percent of total
Building	.266	14.9
Labor	.428	24.0
Equipment	.129	7.2
General supplies	.045	2.5
Electricity and water	.045	2.5
Service department:		
Refrigeration	.837	46.9
Repair and maintenance	.036	2.0
Total	1.786	100.0
Cost range	$1.165 to $2.714	

Cold storage costs per unit tended to decrease as daily volume increased. Only 26 percent of the variations in unit costs among plants was attributable to differences in the daily volumes.

Total processing cost

Average total processing cost was determined separately for the products bottled in glass and those packaged in paper. The average cost of processing in glass, as shown in Table 9, was $35.98 per 1,000 quart units. Costs among plants ranged from $24.71 to $48.15. The filling department accounted for 42 percent of the total. Another 21 percent was accounted for by the washing department. These two departments together with that of clarification, standardization, and pasteurization accounted for 82 percent of the total.

The average cost of 1,000 quart units of processing in paper, as shown in Table 10 was $37.85. Costs among plants ranged from $31.18 to $50.17. The filling department accounted for 65 percent of the total. The clarification, standardization, and pasteurization department accounted for another 18 percent of the total cost. The two together for 83 percent of the total. Total processing cost for packaging in paper averaged $1.97 per 1,000 quart units higher than for bottling in glass. However, in three plants these operations were cheaper for paper than for glass.

The cost per unit of processing in glass tended to decrease as daily volume increased, Figures 20 and 21. Thirty-five percent of the variations among plants in unit cost was attributable to differences in the daily volume of output. This relationship represents a summation of the variations of all

Table 9. Average cost of processing in glass per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Department	Average cost	Percent of total	Cost range	
			Low	High
Receiving and bulk storage	$ 3.513	9.8	$ 1.273	$ 6.625
Clarification, standardization, pasteurization	6.823	19.0	3.486	13.749
Homogenization	1.219	3.4	.284	3.953
Glass washing	7.410	20.6	2.850	14.018
Glass filling	15.231	42.3	6.030	24.178
Cold storage	1.786	4.9	1.165	2.714
Total	$35.982	100.0	$24.708*	$48.150*

*Does not agree with sum of column due to certain plants having high or low costs in one department while only one plant has the highest or lowest total costs.

Table 10. Average costs of processing in paper per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Department	Average cost	Percent of total	Cost range Low	High
Receiving and bulk storage	$ 3.513	9.3	$ 1.273	$ 6.625
Clarification, standardization, pasteurization	6.823	18.0	3.486	13.749
Homogenization	1.219	3.2	.284	3.953
Paper filling	24.511	64.8	19.990	29.177
Cold storage	1.786	4.7	1.165	2.714
Total	$37.852	100.0	$31.180*	$50.171*

*Does not agree with sum of column due to certain plants having high or low costs in one department while only one plant has the highest or lowest total cost.

of the departments contributing to the total cost of processing in glass per unit.

Costs per unit of processing in paper tended to decrease as daily volume increased in the plants studied, Figures 22 and 23. Differences in the daily volume among plants accounted for 48 percent of the variations in unit costs.

General

Considerable variation in costs per unit in the departments of the processing function and in the total for the function itself, was shown by the cost ranges in the above findings. These variations indicated opportunities for reducing costs in the plants studied. The extent of these opportunities would depend upon, among other things, the sources of the variations. Some of these variations were attributed to differences in the volume of product handled, others to differences in the costs

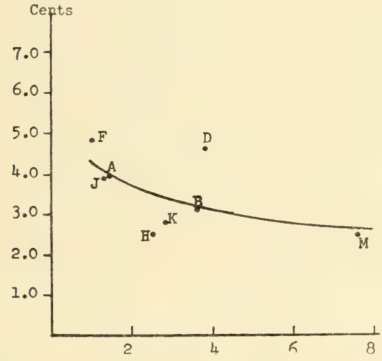

Figure 20. Relationship existing between daily volume and total cost of processing in glass per quart unit, selected Mississippi fluid milk plants 1952-54.

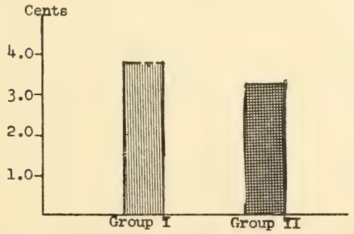

Figure 21. Average total cost of processing in glass per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

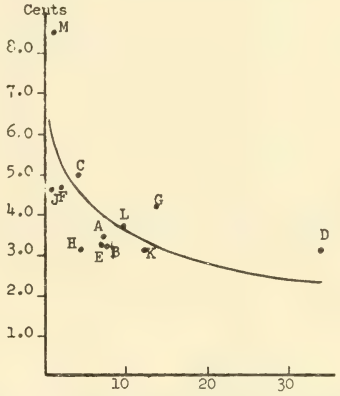

Figure 22. Relationship existing between daily volume and total costs of processing in paper per quart unit, selected Mississippi fluid milk plants, 1952-54.

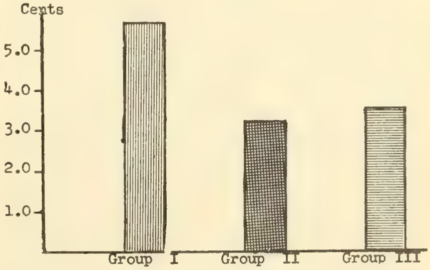

Figure 23. Average total cost of processing in paper per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

and in the proportion in which the resources were combined. Generally, the variations due to differences in the costs of the resources would not be subject to cost-reducing activities. The variations due to differences in the volume of output would be susceptible to activities directed toward reducing costs in the long-run. Most of the opportunities for reducing costs in the short-run were to be found in the variations attributable to differences in the proportion in which the resources were combined.

Before discussing the possibilities for reducing costs in the plants, it seems fittting to mention some of the factors which contributed to higher than average costs in some of the plants. Generally, inefficient utilization of labor was one of the most important factors which contributed to high unit costs. In some of the plants, apparently the labor force was larger than justified by the volume of product being handled. This resulted in a failure to provide sufficient work to utilize the time of the personnel while they were supposedly available.

Most of the other factors contributing to higher than average costs apparently were the result of plant operations at less than the capacity for which it was designed. This resulted in higher than average cost for equipment, labor, building, and, to some extent, supplies. In some instances, bottle-necks in the flow of milk through the plant resulted in high unit costs for certain of the departments.

Apparently most of the opportunities for reducing costs in the plants studied would come about from increases in the volume of product handled. The somewhat indivisible nature of the equipment and labor resources would prevent variations of any extent in the proportion in which these resources would be combined. Therefore, most of the suggestions and generalizations which follow will be directed to practices which will be accomplishable mostly in the long-run.

Reductions in the cost per unit of floor space utilized would be expected to come from an increase in the volume of the product handled. It does not seem practicable to hypothesize that the costs of floor space per unit can be reduced while the same volume of output is maintained.

Labor costs per unit should decrease with an increase in the volume of output. The time required per unit for assembly and clean-up would decrease with an increase in the volume of the operation, resulting in handling a larger volume of product per man-hour. Reductions in the cost of labor per unit of output can be foreseen also, if the time required to handle a given volume of product can be decreased.

Most of the reductions in equipment costs per unit of output generally would result from an increase in the volume of product handled. However, if reorganization of the departments would result in the elimination of unnecessary items of equipment, reductions in unit costs could evolve from this source.

Reducing the requirements for assembly and clean-up per unit of output by increasing the volume of the operation should result in decreases in the cost per unit of general supplies. Also, improvements in the efficiency with which the personnel utilized these supplies would result in reductions in their cost per unit.

Encouragement of the personnel, both delivery and plant, to be more conscientious in the handling of the glass bottles to prevent excessive breakage should result in a reduction in glass-container costs per unit of output. Also, returns of more bottles would result in a decrease in the cost of containers per unit. An interested and conscientious operator of the paper machine might bring about a reduction in paper-container costs per unit by decreasing the losses from torn and leaky containers.

The most pertinent opportunities for reducing the costs of the other factors would be those concerned with reducing the time required to handle a given volume of product. Reductions in power plant, refrigeration, fuel, electricity, water, and repair and maintenance costs could result also from an increase in the volume of output handled.

Distributive Costs[11]

Certain characteristics of the distributive costs per unit could have caused some variation in costs among plants.[12] The costs of the distributive function have been divided into the salary, vehicle, advertising, and other cost categories. These categories will be analyzed separately. Then a summation of their characteristics will be shown by an analysis of total distributive costs per unit of output. Only ten of the plants studied were considered when the model costs were determined. Two of the plants were not included in arriving at the cost for the model, due to their extreme variations from the others. These variations were probably the results of the proportion sold at retail and at the platform.

Salary costs

Differences among plants in the wage scale, type of commission payments, and volume of product handled by each route-man would ordinarily have caused some variations in salary costs per unit of product handled. Also, the proportion of the total product sold as retail, wholesale, or platform sales may have caused some variation in salary costs per unit. There should not have been any salary cost for platform sales.

The cost of distributive salaries per 1,000 quart units was $15.36, Table 11. Costs among plants ranged from $11.01 to $22.92. Salary costs per unit tended to increase as daily volume increased, Figures 24 and 25. However, only 8 percent of the variations in costs among plants was attributable to differences in the volume of operation. The cost range indicates that opportunities existed for reducing salary costs per unit in some of the plants. However, these opportunities may not have been as large as indicated. If lower salaries would tend to attract less capable personnel to the industry, the volume of output might be curtailed or the control over other costs relaxed. This practice could result in diseconomies in other phases of the operation which would more than offset the economies gained from lower salaries. The plants

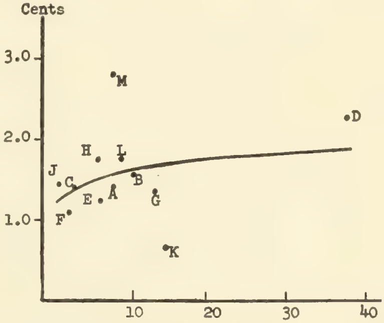

Figure 24. Relationship existing between daily volume and distributive salary costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

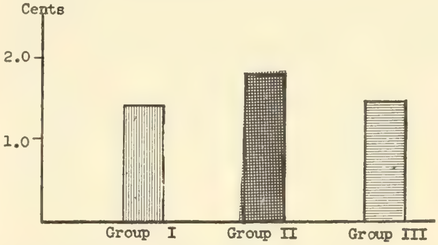

Figure 25. Average distributive salary costs per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

Table 11. Average cost of distribution per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.*

Cost category	Average cost	Percent of total	Cost range Low	Cost range High
Salaries	$15.357	50.0	$11.012	$22.919
Vehicle costs	10.684	34.8	4.145	15.738
Advertising	1.941	6.3	.533	3.548
Other	2.750	8.9	.000	12.567
Total	$30.732	100.0	$26.102**	$38.404**

*Average of ten plants.

**Does not agree with sum of column due to certain plants having high or low costs in one category while only one plant had the highest total cost and another had the lowest.

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[11] The cost of retail store distribution is not included.

[12] See Appendix A, p. 27.

might be justified in paying salaries to attract personnel whose capabilities exceed the firms present requirements. This hypothesis would be true, if expectations were for future operations to require personnel with such capabilities. Capable and efficient personnel should not be sacrificed for lower salaries.

Vehicle costs

Ordinarily, vehicle costs per unit among plants would have varied. Differences in the original costs and depreciation rates of the delivery equipment could have caused some variation. Also, differences in the costs of fuel, lubricants, and tires may have given rise to some variation. Utilization of the distribution vehicles at different percentages of their maximum capacity could have caused other variations. Generally, the larger the number of units of product handled by each vehicle, the less the cost per unit should be. Differences in the size of the sales territory, the number of stops, and the volume sold at each stop might have contributed to the variations. If the stops per mile of route were increased and the volume delivered at each stop increased also, the length of the route would have to either be shortened or the volume handled increased. Either case should result in a decrease in vehicle costs per unit of product handled.

The proportion of the total product sold at retail, wholesale, or platform would have caused some variation in vehicle costs per unit. Costs would have been less for the wholesale than for the retail sales. The platform sales should have had no vehicle expenses.

Average vehicle cost among the plants studied, as shown in Table 11, was $10.68 per 1,000 quart units. Costs among plants ranged from $4.14 to $15.74.

Vehicle costs tended to decrease as daily volume increased. Only 2 percent of the variations in unit costs among plants was attributable to differences in the daily volume of product handled.

If the variations indicated by the range were due primarily to differences in the combination of resources, then opportunities for reducing costs would be present. However, if these variations were primarily the result of differences in the costs of the resources due to accounting methodology, the opportunities for decreasing costs would not be as great as indicated by the range. Also, certain physical characteristics of the sales territory may have been responsible for some of the variations and would not be suited to activities directed at reducing costs

This hypothesis would be true if the sales territory were over-expanded for competitive purposes. This over-expansion is indicated by the use of overlapping routes where the primary purpose would be to afford an opportunity to counteract price manipulation by the competitor. Very little change in the practice of using over-lapping routes would be expected. Therefore, most decreases in vehicle costs ordinarily would come from increasing the total volume handled by each vehicle and the amount sold at each stop.

Advertising costs

Differences in the kind and the scope of advertising programs in effect in each of the plants would have caused costs per unit to vary. The average cost of advertising, as shown in Table 11, was $1.94 per 1,000 quart unit. Costs among plants ranged from $.53 to $3.55. The cost of the advertising program should be determined by the managerial factor. An increase in the cost of advertising would be justifiable if it resulted in an increased volume, provided, however, the increased volume brought about economies in the total operation which would more than offset the cost of advertising. Advertising would also be justified if returns to the business were increased sufficiently by the program.

Other costs

Normally, other distributive costs per unit should have varied among plants. These variations would have been due to differences in the costs of supplies, building, and certain equipment items used by the distributive function. Whether or not the trucks were refrigerated by ice or by ammonia would have caused some variations.

The cost of advertising was included with other distributive costs when the unit costs were related to 1,000 quart units. The relationship which existed is shown in Figures 26 and 27. Eight percent of the variations in costs per unit among plants was accounted for by differences in the volume of output daily.

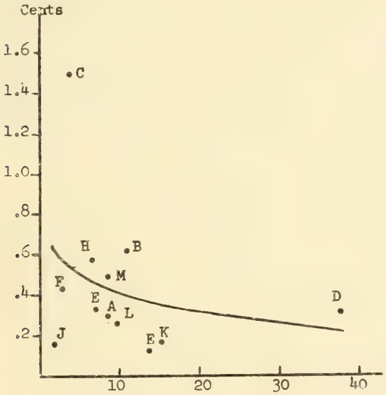

Figure 26. Relationship existing between daily volume and other distributive costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

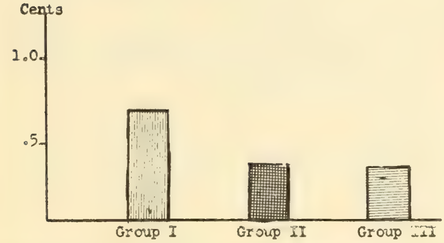

Figure 27. Average other distributive costs per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

Generally, other costs per unit would be expected to decrease as volume handled increased. The average of other costs per 1,000 quart units was $2.75, Table 11. Costs among plants ranged from $.00 to $12.57. Apparently, opportunities existed for decreasing other distributive costs. However, these opportunities would not have been as large as indicated by the range. Since most of the other costs consisted of building and supplies, an increase in the volume handled should result in a decrease in costs per unit. Utilization of the supplies in a more efficient manner should also give rise to decreases in unit costs.

Total distributive costs

The sources and causes of variations and the generalizations of the preceding analysis of the cost categories would be applicable to total distribution costs. Ordinarily, these costs per unit would vary among plants.

Average total distributive cost, as shown in Table 11, was $30.73 per 1,000 quart units. Costs among plants ranged from $26.10 to $38.40. Salary costs accounted for 50 percent of the total. Another 35 percent was accounted for by vehicle costs. Only .02 percent of the variations among plants in total distributive cost per unit was attributable to differences in the daily volume. Total distributive cost per unit tended to remain relatively stable regardless of the volume of output daily, Figures 28 and 29.

Apparently, most of the opportunities for reducing unit distributive cost would be those directed toward decreasing the unit costs of the salaries and of the vehicles. Reduction would most likely come from adjustments in the vehicle costs, since the salaries would probably be retained on the same basis as was formerly used.

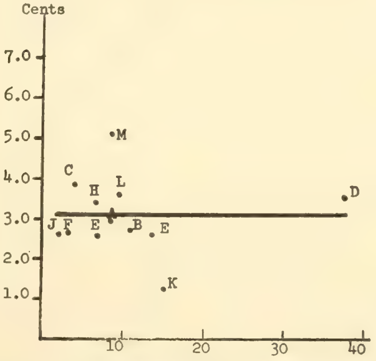

Figure 28. Relationship existing between daily volume and total distributive costs per quart unit, selected Mississippi fluid milk plants, 1952-54.

Total Handling Costs[13]

The previous analysis of the functions, departments, and cost categories would be applicable to the total costs of handling. These costs were determined separately for the glass and the paper operations.

The average total cost of handling the products bottled in glass, as shown in Table 12, was $76.38 per 1,000 quart units. This cost did not include the costs of the raw product or of procurement. Adminstration, processing, and distribution costs accounted for 12.7, 47.1, and 40.2 percent, respectively, of the total. Total handling costs per unit ranged from $66.07 to $89.28 per 1,000 quart units.

The average total cost of handling the products packaged in paper was $78 25 per 1,000 quart units, Table 12. Costs among plants ranged from $71.80 to $104.25. The administrative, processing, and distributive functions accounted for 12.3, 48.4, and 39.3 percent, respectively, of the total. The average total cost for handling the products in paper was $1.87 higher than it was for handling in glass.

The filling costs were averaged in order to obtain a total cost of handling per unit, without reference to the type of container in which the product was packaged. The relationship, Figures 30 and 31, showed that total costs

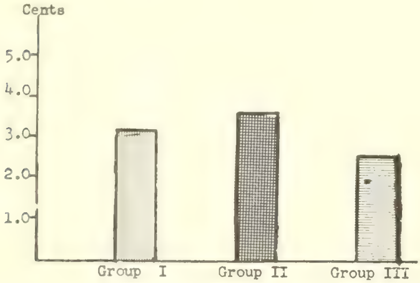

Figure 29. Average total cost of distribution per quart unit by size groups, selected Mississippi fluid milk plants, 1952-54.

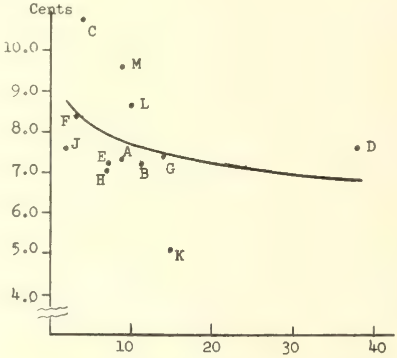

Figure 30. Relationship existing between daily volume and total cost of handling per quart unit, selected Mississippi fluid milk plants, 1952-54.

Table 12. Average total cost of handling per 1,000 quart units, selected Mississippi fluid milk plants, 1952-54.

Function, department and cost category	Glass operation		Paper operation	
	Average cost	Percent of total	Average cost	Percent of total
Administration:				
Salaries	$ 6.203	8.1	$ 6.203	7.9
Other	3.461	4.6	3.461	4.4
Sub-total	9.664	12.7	9.664	12.3
Processing:				
Salaries	10.544	13.8	5.735	7.3
Building	2.295	3.0	1.234	1.6
Equipment	5.262	6.9	6.426	8.2
General supplies	5.612	7.3	4.041	5.2
Containers	6.232	8.2	16.568	21.2
Electricity and water	.812	1.1	.615	.8
Service Department	5.225	6.8	3.233	4.1
Sub-total	35.982	47.1	37.852	48.4
Distribution:				
Salaries	15.357	20.1	15.357	19.6
Vehicle costs	10.684	14.0	10.684	13.7
Advertising	1.941	2.5	1.941	2.5
Other	2.750	3.6	2.750	3.5
Sub-total	30.732	40.2	30.732	39.3
Total	$76.378	100.0	$78.248	100.0
Cost range	$66.070 to $89.281		$71.800 to $104.246	

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[13] Does not include the cost of milk losses in the normal handling process within the plant.

of processing per unit decreased as daily volume increased. However, only 13 percent of the variations among plants in unit costs was accounted for by differences in the daily output.

It was pointed out in the previous analysis of the functions, departments, and cost categories that some of the causes of variations in unit costs among plants were not susceptible to cost-reducing activities. The same would hold true for total handling costs. However, alteration of the proportion in which the resources were combined should effect a decrease in total handling costs in the same manner it would for the functions, departments, and cost categories.

Comparison of Costs

A comparison of the model costs with those of 16 plants in four size groups is shown in Table 13. Four of the Mississippi plants were included in the 16 Southern plants, one in each of the size groups. Therefore, the costs of certain of the Mississippi plants would have influenced both the model and the costs for the 16 plants. However, the influence of the four Mississippi plants would not have been as great on the results for the Southern plants as it was for the model. This would be true because the ratio of other plants to the four Mississippi plants was 3 to 1 for the Southern region and 2 to 1 for the model.

Cost of administration per unit was lower for the Mississippi plants than for three of the four groups of the Southern region, but was higher for the largest, or Group IV. This indicates that the Mississippi plants were relatively efficient by comparison in the utilization of resources for administration.

Average receiving and bulk storage costs per unit were higher, generally, in the Mississippi than in the Southern plants. Clarification, standardization, and pasteurization, and glass-washing costs per unit were considerably lower in the Southern than in the Mississippi plants. Also, glass-filling costs per unit were lower in three of the four groups of the Southern plants. Paper-filling and cold storage costs per unit were lower for the Mississippi plants than for three of the four groups. Generally, total costs of processing in paper

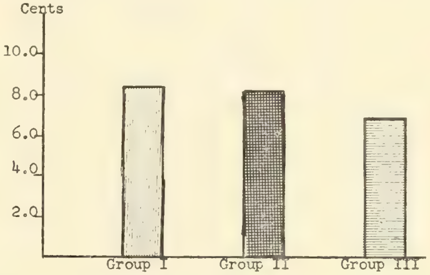

Figure 31. Average total cost of handling per quart unit by size groups, selected Mississippi fluid milk plants 1952-54.

Table 13. Comparison of average costs per quart unit of selected Mississippi plants with 16 Southern plants in four size groups.

Item	Mississippi plants		Southern plants*							
			Group I		Group II		Group III		Group IV	
	Paper	Glass	Paper	Glass	Paper	Glass	Paper	Glass	Paper	Glass
					Cents					
Administration	.966	.966	1.006	1.006	.988	.988	1.076	1.076	.884**	.896**
Processing:										
Receiving	.351	.351	.350	.350	.279	.279	.248	.248	.354**	.319**
Clar., stand., past.	.682	.682	.460	.460	.404	.404	.483	.483	.271**	.255**
Homogenization	.122	.122	.243	.243	.198	.198	.088	.088	.059**	.088**
Glass washing		.741		.539		.487		.511		.552
Glass filling		1.523		1.128		1.346		1.272		1.555
Paper filling	2.451		3.512		2.531		3.219		2.434	
Cold storage	.179	.179	.319	.319	.225	.225	.205	.205	.145**	.169**
Total	3.785	3.598	4.641	2.796	3.439	2.741	4.155	2.719	3.204	2.850
Distribution	3.073	3.073	4.011	4.011	3.301	3.301	4.212	4.212	3.760**	4.033**
Total cost of handling	7.824	7.637	9.658	7.813	7.728	7.030	9.443	8.007	7.848	7.779

*Penny, N. M., and Purcell, J. C., an unpublished manuscript prepared and distributed to members of the Technical Committee of the Southern Regional Dairy Marketing Project, SM-10, January, 1955.

**Differ because only three of the four plants in this group had a paper operation, and only the three plants were used in the average.

were lower, while costs for processing in glass were higher for the Mississippi than for the Southern plants. Average distributive costs for the Mississippi plants were considerably lower than for the Southern plants. This comparison indicates that either the Mississippi plants were more efficient in the utilization of resources for distribution, or had a higher proportion of the product sold at wholesale or at the platform.

Average total costs of handling per unit were generally lower in the Mississippi than in the Southern plants. Generally, administrative and distributive costs were lower and processing costs, except for the paper operation, were higher in the Mississippi than in the Southern plants. However, the inefficiencies in the processing function were more than overcome by efficiencies in administration and distribution, by comparison, resulting in generally lower total costs of handling per quart unit for the Mississippi plants.

SUMMARY AND CONCLUSIONS

The rapid growth of the fluid milk industry in Mississippi has brought about a need for some basis from which economic adjustments can be made in the utilization of the resources of production within the processing plants. This study has been directed toward the development of such a basis. It was felt that the basis could best be developed through the accomplishments of certain intermediate objectives. Specifically, these were to determine whether or not there were economies to scale of operation; to determine the cost of performing the various functions by studying input-output relations; to evaluate major cost items as they affected the cost of operation; and to suggest alternatives for reducing costs in all phases of the operation.

Data were collected from 12 fluid milk-processing plants selected on the basis of size and type of operation, geographical location, type of records maintained, and their influence on other plants within the state. Some of the plants processed products other than those sold as Class I or fluid. In such cases, costs of the fluid operation were isolated from the others and analyzed separately. The cost data were taken from the accounting records of the firms and assigned to the functions, departments and cost categories on the basis of actual or estimated utilization. The results of the analysis of these data will be applicable to the plants studied and to plants having like characteristics in most respects.

Considerable variability among plants was found in costs per unit of output. Attempts were made to relate some of this variability to differences in the volume of output which existed among plants. Mathematical curves, logrithmic in the independent variable (volume), were fitted to the data as one means of relating unit costs to volume. Also, the plants were divided into size groups for cross-tabulation analysis.

The average cost of administration per 1,000 quart units for the plants studied was $9.66. Costs among plants ranged from $4.22 to $15.67. Administration accounted for 12.3 and 12.7 percent, respectively, of the total cost of handling in paper and in glass.

The average total cost of processing in paper per 1,000 quart units was $37.85. Costs among plants ranged from $31.18 to $50.17. The costs of the paper-filling department were 65.8 percent of the total.

For processing in glass, the average total cost per 1,000 quart units was $35.98. Costs among plants ranged from $24.71 to $48.15. The washing and the filling departments accounted for 62.9 percent of the total processing costs. The average total cost of processing in glass and in paper accounted for 47.1 and 48.4 percent, respectively, of the total cost of handling. Average processing costs per 1,000 quart units were $1.87 lower for the products packaged in glass than for those packaged in paper.

Distributive costs accounted for 39.3 and 40.2 percent, respectively, of the total cost of handling in paper and in glass. The average total cost of distribution per 1,000 quart units was $30.73. Costs among plants ranged from $26.10 to $38.40. Salaries accounted for 50 percent of the total distributive costs.

Average total cost of handling per 1,000 quart units was $78.25 when the products were packaged in paper and $76.38 when bottled in glass. Costs among plants ranged from $71.80 to $104.25 when the products were packaged in paper. When glass bottles were used, costs among plants ranged from $66.07 to $89.28 per 1,000 quart units. Labor accounted for 34.8 percent of the total costs in paper and 42 percent in glass.

Generally, average costs per unit of the Mississippi plants were lower for the products packaged in paper and higher for those bottled in glass than those of distributors in the Southern area during the same time period. Average distributive costs were considerably lower, also, in the Mississippi plants than for Southern plants.

The trend for total costs of handling per unit to decrease as the volume of output increased suggests that there were economies resulting from larger operations. Whether these economies were the result of pure-scale relationships or variable proportions in the combination of resources could not be determined. This study indicates that most of the decreases in unit costs resulting from increases in the volume of the operation would appear in the administrative and processing functions. Unit cost of distribution did not appear to be affected to any extent by the volume handled. Costs within the individual plant, providing it was operating at less than the optimum volume, should be subject to more economies from increases in the size of operations than was indicated for the industry.

Some of the variations among plants in unit costs, as shown by the range of costs, were due to differences in the accounting methodology, and to original costs and depreciation rates of the assets. Other variations were due to differences in the proportion in which resources were combined.

The range in unit costs among plants indicates that opportunities existed for decreasing handling costs. However, the opportunities were not as great as indicated. The differences in the costs of the buildings and equipment resources and certain other fixed assets would not be subject to alterations of any magnitude in their affect upon unit costs. The major attack for decreasing costs should be directed toward the proportion in which the resources were combined within the plants. Opportunities existed for improving the efficiency with which labor, equipment, and supplies were utilized in some of the plants. Improvements in the efficiency with which these resources were utilized should result in a decrease in unit costs. However, the magnitude of the cost decreases which would result could not be definitely established.

APPENDIX A

Procedure

The problems encountered in the collection of data from the plants and in making allocations to departments depended largely upon the type of accounting records maintained by the plants. In some cases the costs required in Section I of the field schedule could be taken directly from the plant's profit and loss statement. However, in some instances, it was necessary to gather this information from unassembled records, such as invoices and plant inventories.

The assignment of costs to the functions of administration, procurement, processing, and distribution was made on the basis of actual or estimated requirements for each of these functions. These allocations will be explained in more detail as the procedures are developed further in this section.

A floor plan was prepared for each plant[14] and sample observations necessary for the allocation of plant labor costs were made, concurrent with the collection of the data from plant records.

---

[14] The plant was divided into the productive departments: receiving and bulk storage; clarification, standardization, pasteurization; homogenization; glass washing; glass filling; paper filling; cold storage; and, the service departments: dry storage, power plant, refrigeration, and repair and maintenance; also, the departments related to processing other products, such as, ice cream, condensery, and cottage cheese, when applicable.

Allocation of Labor Costs Among Departments

The distribution of labor costs in the individual departments was one of the more time-consuming tasks of the study. Prior to making the sample observations, a route was worked out for the observer to follow through the plant, whereby he might observe all of the personnel and of the operations. Also, each employee was given a number which was to be recorded for the department in which he was working on each observation trip through the plant. It was necessary to record each employee, due to differences in individual wage rates, in order to arrive at a more representative allocation of labor costs to each department.

Observation trips through each plant were made at 20 or 30 minute intervals. A comparison of the co-efficients of variations of the data collected in the Pilot Study on the different intervals indicated that there was no significant difference in reliability between the intervals. In all cases, the information was extremely variable.

The information obtained by the observation trips was summarized and converted to percentages of each individuals time utilized in the respective departments. These percentages were then applied to the individuals annual salary in order to derive the allocation of costs for each individual to the various departments for the year. The sum of the individual labor costs for each department determined the total labor cost allocated to each respective department.

Allocation of Total Costs to Functions and Departments

Total costs were allocated to the functions by cost items. After total processing costs were determined, they were allocated to the productive and service department by cost items, then the costs of the service departments were prorated to the productive departments which they served. The basis of allocating these cost items was as follows:

1. Building costs, including depreciation, repairs, taxes, and rent, were computed for the entire building or buildings and distributed to the various functions and departments on the basis of floor space utilized.

2. Labor costs, including wages, social security tax, state unemployment tax, and hospitalization benefits, were allocated to the functions, then to the departments of the processing function by the procedure explained above.

3. Equipment costs included depreciation, repair, and machine rental. Depreciation costs were allocated to the functions and the processing departments on the basis of the utilization of each machine to which the depreciation cost was applicable as determined from plant depreciation schedules, where available. In cases where the depreciation costs for each machine were not available, the costs were allocated on the basis of an index derived for a similar size and type of plant in this study. Repair costs were distributed in proportion to depreciation costs. Machine rental was allocated to the machine, function, and department to which it was applicable.

4. Container costs were determined as glass, paper, ice cream, cottage cheese, and other, and allocated to the appropriate department.

5. Manufacturing supplies included those supplies, such as sugar and chocolate, used in making the products. The costs were allocated to the clarification, standardization, and pasteurization departments.

6. General supply costs were those of cleaning compounds, etc. These costs were allocated to the various processing departments in relation to the index of direct labor time.

7. Fuel costs were allocated to the power plant departments.

8. Electricity and water costs were allocated to the various departments on the basis of an electricity and water utilization index computed in a pilot study of a North Carolina Plant.

9. The cost of dry storage was prorated among the productive departments on the basis of the estimated

utilization by the respective departments.

10. The power plant cost was allocated to the productive departments on the basis of the steam utilization index worked out in the North Carolina study.

11. The cost of refrigeration was also distributed on the basis of information obtained through the North Carolina study.

12. The cost of repair and maintenance was allocated to the productive departments in relation to the index of direct labor time.

Administration and Distribution Costs

In some cases, products other than those construed as fluid milk products were handled by the firms. Often it was impossible to determine the actual allocation of administration and distribution costs to the fluid products. Whenever such circumstances existed, total administration and distribution costs were prorated to the fluid and other products on the basis of volume of milk utilized for each respective type. For example, if 20 percent of the volume were utilized in manufacturing ice cream and 80 percent were utilized in fluid products, then, 20 percent of the total administration and/or distribution costs would be assigned to ice cream and 80 percent to fluid products.

Volume of Milk Processed

The volume of milk handled by the functions and departments was obtained from plant sales records, daily load-out sheets, records of producer receipts, and in some cases from Pure-Pak reports. Information relative to type of product and size and type of container, was collected whenever available. All of the products were converted to a quart unit basis. For example, two pints, regardless of the product, equaled one quart unit.

The quantity for the receiving and bulk storage department represented only the milk purchased from producers. The quantity for the clarification, standardization, and pasteurization department represented all milk processed through this department regardless of source. The quantity homogenized was determined from plant records where available or from estimates by the plant managers. The quantities for the filling and cold storage departments represented all milk handled by these departments as determined by plant records. The quantities for administration and distribution were the total amounts processed by the plant and sold as fluid products.

Costs Per Unit of Output

Costs per unit of output were derived by dividing the cost assignable to each department or function by the quantity of milk in quart units handled by it.

Model Costs

Costs for the model were determined by taking a simple average of the unit costs of the plants studied. All of the plants were utilized except in certain instances. Only eleven plants could be used for determining the model costs for the administration function due to an inability to separate office salaries from other expenses. One plant was not utilized in determining paper-filling costs per unit for the model due to its having a paper-filling operation which was different from the others. Only the eight plants having glass operations were included when model costs were determined for glass washing and for glass filling. Two plants were not included when determining model costs for the distributive function due to the extreme variations of their costs as compared to those of the other plants.

APPENDIX B

Statistical Supplement

Certain statistical procedures were used in determining the relationship existing between unit cost and daily volume in the Mississippi plants. Mathematical curves using logarithms in the independent variable were fitted to the data for unit costs and daily volume. These curves were determined by the standard statistical least-squares method. The b-value which was derived indicated the magnitude of the incerase or decrease in unit costs which corresponded to an increase of one unit in the logarithm of the volume. If the b-value were negative, a decrease in unit costs was signified; if positive, an increase in unit costs was indicated. A summary of the regression analyses which were calculated is shown in Appendix Table 1.

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Appendix Table 1. Summary of logarithmic regression analyses.

	Figure	X	Y	b	t	r^2
Administration	4	3.91449	.94936	- .281106919	.888	.0731
Receiving	6	3.98669	.35125	- .249837612	1.774	.2393
Pasteurization	8	3.95940	.68229	- .690191018	3.301	.5214
Homogenization	10	3.69068	.12194	- .1821293555	2.8460	.4475
	12	3.39604	.89975	- .754199484	1.0369	.1519
	14	3.39604	.65448	- .137838262	.3610	.0213
	16	3.74356	.88817	- .569401512	3.0620	.4839
	18	3.74356	1.94643	-1.003237761	1.5768	.1991
	20	3.39604	3.51941	-1.916962881	1.8096	.3531
	22	3.74356	4.16878	-2.374194298	3.1156	.4798
	24	3.91449	1.57087	.469310062	.9069	.0760
	26	3.91449	.44653	- .320367964	.9275	.0792
	28	3.91449	3.09717	- .037750993	.0049	.0002
	30	3.91449	7.825	-1.58806195	1.2262	.1306

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Industrialization and a Market For Food Products In the Columbia Trade Area

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

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ACKNOWLEDGMENT

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Industrialization and a Market For Food Products In the Columbia Trade Area

By

Dorothy Dickins, L. D. Welch and W. E. Christian

INTRODUCTION

How can the Marion County farmer benefit more from local industrial development? How can he get more of this added market? These are questions with which this report is concerned. The report includes information from retailers handling milk, pork, broilers, beef, eggs, leafy vegetables, sweet potatoes and tomatoes. It also includes information from representative families in the Columbia trade area concerning food consumption practices and preferences regarding these foods.

Market and family data will be related to help answer questions such as how industrialization has increased market outlets for farmers and as a basis for suggesting ways in which the increased market due to industrialization can better be made available to local producers.

While Mississippi has placed much emphasis on the development of industry within its borders in the last decade, some of its smaller cities in agricultural areas have had a fair degree of industrialization over a longer period of time. Columbia, in Marion County, is typical of those towns in which manufacturing industries have afforded non-farm job opportunities since the thirties or earlier. In 1953 a garment plant, a knitting mill, a canning plant, a veneer mill, a naval stores plant, a box factory and several small plants of other types were providing employment for an average of 1,331 workers annually.

In Appendix Table 1 is given a breakdown of yearly average employment, payrolls, and average annual wage per worker in manufacturing and other non-farm industries in Marion County for the period 1950-53. Although the average number employed in manufacturing was relatively high for each of these years, this employment was highly seasonal. Figure 4 shows that, on the average, manufacturing employment in the county has been high during the first half of the year, but has dropped off after June of each year.

The latest census statistics show that from a total labor force of 8,435 in the county in 1950, 8,268 were gainfully employed. This employment was divided among principal occupational groups as follows: agriculture, 3,420 (41.4 percent); manufacturing, 1,412 (17.1 percent); and trade, service, and other industries, 3,436, (41.5 percent). Thus, while Marion County is classed as an agricultural county, fewer persons were engaged in agriculture than in trade, service and related jobs, while more than one out of each six employed persons was employed in a manufacturing industry. More than one-third (37.7 percent) of these workers in manufacturing were women.

Agriculture practiced in the area is predominantly of the general type. Cotton and small-scaled livestock enterprises provide the principal cash farm income, though vegetables, either for canning or for the fresh market, are produced on a large number of farms. Livestock production is becoming of increasing importance in the county. Census data show that the number of farms from which cattle and calves were sold, and the number of such animals sold, nearly doubled in the ten-year period 1939-1949. The same is true for farms producing hogs for the market. While most of these were small-scaled operations, several large cattle enterprises have been established in the county within the last few years.

Many persons have been attracted away from the farm by opportunities afforded by manufacturing and related employment in town. Others have continued to live on the farm, but worked elsewhere. Some of these depend less on home production for their food supply than they formerly did. These shifts away from home production should presumably afford increased marketing possibilities for food products.

THE FAMILY SURVEY

Two hundred and sixty-two families in Marion County were interviewed during June 1953. One hundred and twenty-six lived in Columbia, henceforward designated as the urban area; and 136 lived within a 10-mile radius of the city, henceforward designated as the rural area. While the data were obtained in 1953, they are applicable now since food patterns and real incomes change slowly.

Dr. Earl E. Houseman, Statistical Assistant, Office of Marketing Services in the U. S. Department of Agriculture, drew the areas in which the rural interviewing was to be done in such a way that a representative sample of all families in the area were visited. Rural areas were sampled at the rate of about one in fourteen. The urban sample was drawn from a list of family dwellings having water meters. This sample was supplemented with one taken from a list of dwellings without water meters, compiled with the assistance of water-meter readers for the city.

One in every thirteenth dwelling in the urban area was visited. However, only families of two or more members who have at least one meal per day in the home together were interviewed. It is this type of family that is most important from the consumer-market viewpoint. Likewise families in existence less than one year were not surveyed, since it was necessary to relate consumer-market data to annual family income.*

Supplementary data were obtained by questionnaire from 30 percent of the urban and 44 percent of the rural sample in December, 1953. Families returning the questionnaire had slightly higher income than families in the entire sample.

Description of the Families

Rural families included in the sample averaged nearly one more member than urban families (4.0 members as compared with 3.2 members). Twenty-six percent of the rural families had family heads of 60 years of age or over; the percentage for urban families with heads as old was nearly as great—20. Almost three-fourths of the families in both the urban and rural samples were white families (73 and 70 percent respectively). The main difference in the urban and rural families is therefore in number of members, families in the rural sample being larger.

Both husbands and wives in urban families had much more schooling than those in rural families. The percentage of families with husbands and wives who had completed high school or attended college was:

	Urban	Rural
Husbands	30%	14%
Wives	35%	18%

Likewise more rural families had husbands and wives who had not completed grammar school. These percentages were:

	Urban	Rural
Husbands	26%	48%
Wives	21%	32%

There are two types of facilities which are closely related to shopping habits of the consumer-buyer. These facilities are communication and refrigeration. The percentage of families having specified facilities of these two types are shown in Figure 1.

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*There were 142 dwellings with 157 families in the Columbia sample and 178 dwellings with 150 families in the rural sample. In Columbia 3 of 142 dwellings were vacant at the time of the interview; 25 families were ineligible; 6 homemakers could not be contacted or were unable to cooperate. In the rural sample 28 of the 178 dwellings were vacant at the time of the interview; 14 families were ineligible. Records were obtained from all eligible families.

Source and Distribution of Family Income

From what sources did urban and rural families obtain their incomes? What were family incomes the year preceeding the interview (1952-53)? What members had off-farm work experience? Answers to questions such as these give basic background information for understanding the local food marketing situation.

More families in both urban and rural samples received income from off-farm earnings than any other source, as is shown:

Families with:	**Urban**	**Rural**
Income from farm operation	2%	57%
Income from off-farm earnings	94%	77%
Income from other sources	34%	36%

Income from "other sources" includes income from pensions, welfare payments, interest, net from rental property and the like. Percentages in the above summary total more than 100 because some families received income from a combination of these sources.

Figure 2 shows the distribution of urban and rural families by net cash income.* As will be noted, the greater percentage of families in the urban area had incomes of $3000-$4999, while the greater percentage in the rural area had incomes of $1000-$2999.

When the 126 urban families are arranged by net money income from the lowest to highest, the income of the middle family was $3270. When the rural families are thus arranged income of the middle family was about one-half as great—$1578. But there was a

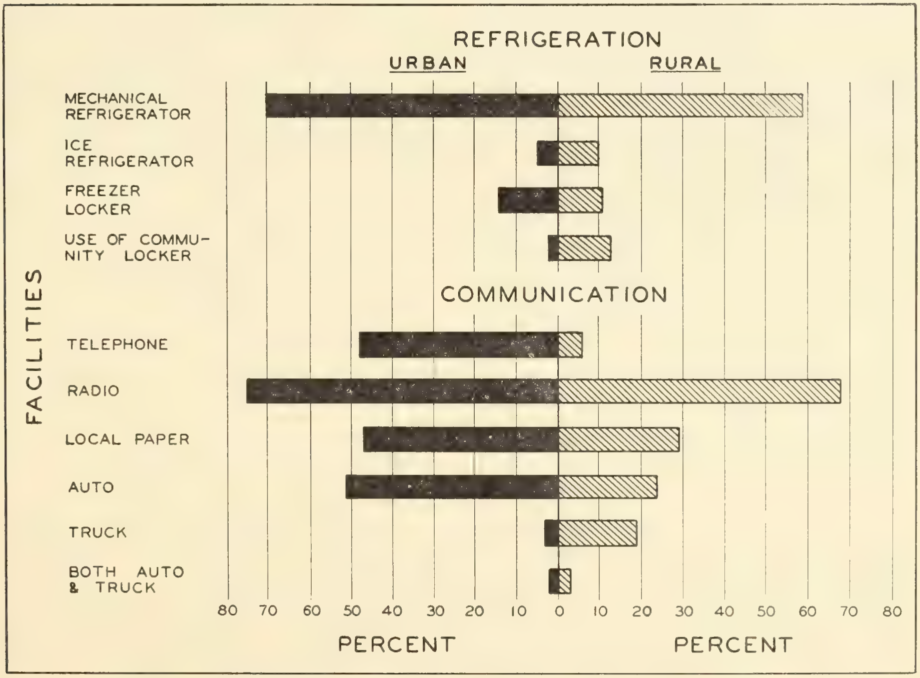

Figure 1. Percentage of urban and rural families with specified refrigeration and communication facilities.

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*In a few cases where income was not obtained the family was placed in an income class on basis of kind of work and other type of socio-economic data that could be secured.

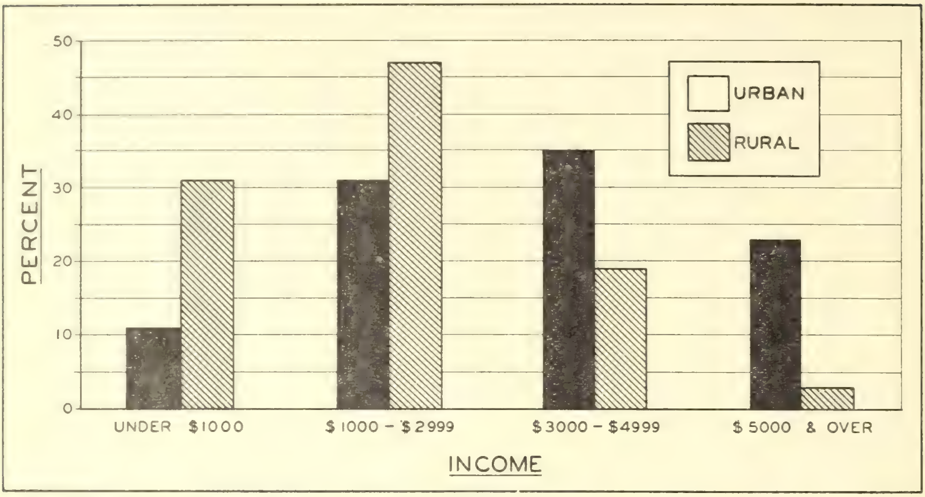

Figure 2.—Distribution of urban and rural families by net income, 1952-53.

difference in the middle income rural family who operated a farm and the middle income rural family who did not. The income of the middle farm operator family was $1217; that of the rural non-farm family—$2400. It would seem that in spite of industrial development the farmer still lags behind in returns for his labor.

Income per capita (1952-53) was figured for Marion County using as a basis incomes of the 262 families included in the survey. Thus figured, average per capita income was $597. It is well to ask at this point how $597 agrees with other estimates. One such estimate was made for the years 1940-53 from data of the State Tax Commission. This estimate was about $50 more per capita (see Table 2 in the Appendix). When it is considered that these two income estimates were arrived at by entirely different means and based on data from different sources, the fact they differ by less than 10 percent should serve to add reliability to the information obtained from the families in the survey.

To understand the occupational situation of an area it is necessary to know not only the income and the proportion of families deriving income from different sources, but also the main occupation of the family head, wife and other employed family members.

As is known, some persons have more than one ocupation; that is, they are farm operators and have work off the farm also. Listed below is the proportion of families in the survey with specified members having as their **main** occupaton work other than farm operation. Also shown is the percentage of those engaged in non-farm work who had jobs in manufacturing.

	Urban		**Rural**	
	Non-farm	**Non-farm mfg.**	**Non-farm**	**Non-farm mfg.**
Husband (or male head)	78%	10%	44%	30%
Wife (or female head)	36%	28%	18%	78%
One or more others in family	11%	18%	8%	25%

The summary shows that factory work is a very important type for the rural homemaker. Many more had had non-farm work experience than were engaged in non-farm work at the time of the study. In the urban sample

98 percent of the husbands and in the rural sample 70 percent of them had done non-farm work of some kind at one time. Seventy percent of the wives in the urban sample and 63 percent in the rural sample had done work of this type since marriage.

Consumer Shopping Habits

The middle income family in the urban sample spent about $240 per capita per year for food; the middle income family in the rural sample spent about $106. But families varied greatly in per capita expenses for food. Food expenditures were figured for the county using as a basis expenditures of the 262 families. Thus figured, average per capita expenditures were $137. This estimate is about the same as that derived from taxable retail food sales (see Table 3, Appendix Column 3). That derived from retail food sales was $139.

The 262 survey families spent on an average 23 percent of their income for food. As will be noted from Figure 3, 20.5 percent of the retail dollar (using retail sales in Marion County compiled from Tax Commission reports) was spent for food.* Increases in the percentage of the consumer's dollar spent for food in 1954 over the five-year average (in both county and state) indicate an increasing dependency upon the market for the food supply.

Grocery stores used

Rural families traded at fewer grocery stores than did urban families. The percentage of families mentioning specified numbers of groceries at which they traded was:

	Urban	Rural
One grocery store	19%	21%
Two grocery stores	27%	40%
Three grocery stores	43%	36%
Four or more grocery stores	11%	3%

All the grocery stores named by urban families were in Columbia, while 74 percent named by rural families were in Columbia.

Urban families traded around somewhat more than rural families and had traded a shorter time with the groceries named. Fifty percent of the groceries named by urban families and 60 percent by rural families had been traded with more than five years.

Although rural families in this survey lived within a 10-mile radius of Columbia, there were two families who lived as far as 16 miles by way of the road to the city. Thirty-five percent of the families in the rural sample lived from 11 - 16 miles from Columbia.

Only eight percent of the rural families did not mention a Columbia grocery store when asked to report grocery stores where traded. But 15 percent of those families eleven or more miles away from Columbia did not mention a grocery in this city. One of the 11 families not mentioning a Columbia grocery store lived as close as 5½ miles; another, 6 miles. The remainder lived 8 or more miles away.

The wife (or female head) was the person who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. But men in relatively more rural families shopped for food or assisted in this activity.

Buying from local producers

The amounts of specified food products purchased from local producers by urban and rural families during one year (1952-53) are shown in Table 1. These are estimates made from purchases by urban and rural families in the survey. Also, the percentage of families buying each product this way is shown.

Eggs was the product most often purchased this way by both urban and rural families (Table 1). Much of the direct buying from producers was from relatives and neighbors. In "beef and veal" and "pork" are included animals purchased at the livestock market for slaughtering and use in the locker.

Those buying direct from the producer bought in large quantities, but relatively few families bought this way. Nor was there a desire on the part of most consumers to buy from

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*Table 4 in Appendix gives dollar volume of taxable retail sales.

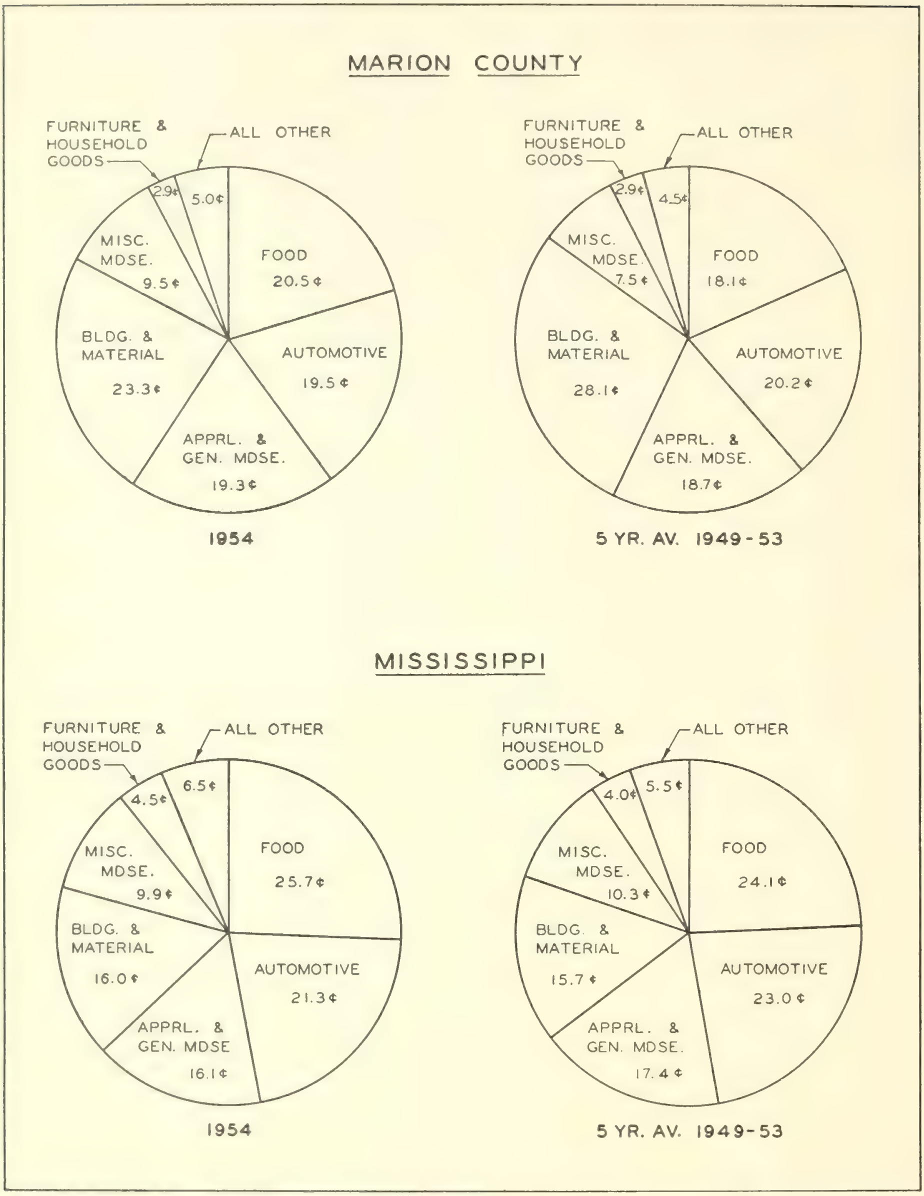

Figure 3. Division of the Retail Dollar by Classes of Consumers Goods, Marion County and Mississippi.

producers. One of the important reasons given was the inconvenience. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled. For rural people inconvenience was a secondary reason, however. "Produce own, don't need" was the comment most often given when questioned about buying direct from producers.

Urban homemakers when questioned about practices of buying from producers often made comments such as: "This kind of milk is not healthy"; "Want chickens dressed and cut up"; "This kind of beef not healthy"; "Producers sell in large pieces, we want small pieces"; "They don't give credit."

Other shopping habits

The amounts of purchased vegetables, eggs, and broilers used during the report week and amounts bought at the last purchase were about the same. But for beef and pork amounts at the last purchase were considerably higher than amounts used. A few families bought meat in large quantities from farmers or at the livestock market, and had it processed at the local slaughter house to put in food freezers. These last purchases raised the general average. Meat for freezing seems to offer possibilities of an increased outlet for local meat. As has already been pointed out, 14 percent of the urban families had a freezer-locker; 2 percent used the community locker. These proportions may increase with time, especially if good meat is available.

From sample data it would seem that milk is purchased about three times a week. Rural families who used purchased milk used an average of 7.6 quarts and their last purchases averaged 2.4 quarts. Urban families who had bought milk used an average of 9.3 quarts, yet their last purchases averaged 3.1 quarts.

The percentage of families whose last purchase* of certain foods was made at a retail grocery store in Columbia are shown below:

Purchased food:	**Urban** %	**Rural** %
Mustard greens	88	100
Turnip greens	100	100
Cabbage	100	100
Tomatoes	96	91
Whole milk	61	56
Buttermilk	67	44
Broilers	95	63
Ham	100	100
Sausage	100	31
Pork chops	100	80
Fat back	100	63
Bacon	99	85
Beef hamburger	95	75
Beef roast	94	56
Beef steak	96	80
Eggs	70	35

Vegetables not bought in Columbia were purchased from rural groceries in the county or from farmers. Much of the milk not purchased by urban families from Columbia groceries was bought from a milk plant. Thirty-four percent of the last purchases of whole milk, 22 percent of buttermilk was bought this way.

To the rural family the rural grocery and the local producers were important sources for purchases. Twelve percent of last purchase of whole milk by rural families was from a rural grocery, 24 percent from a local producer.

When last purchases of specified foods were classified by whether for cash or credit, it was found that a little more than one-fourth of them were credit. Urban and rural families did not differ much in this respect, but slightly more urban famlies used credit.

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*Includes only families using during report week specified foods obtained by purchase.

Table 1. Estimated total amounts of specified food products bought from local producers during 1952-53 by urban and rural families in Marion County and percentage of urban and rural families buying this way.

Food product	Urban families		Rural families	
	Quantity bought	Percent buying	Quantity bought	Percent buying
Whole milk	8,439 (qts.)	6	72,326 (qts.)	9
Eggs	47,494 (doz.)	31	18,038 (doz.)	13
Broilers	6,760 (no.)	7	2,987 (no.)	4
Tomatoes	13,549 (lbs.)	17	1,537 (lbs.)	1
Sweet potatoes	16,060 (lbs.)	8	55,564 (lbs.)	4
Leafy vegetables	7,592 (lbs.)	11	261 (lbs.)	2
Beef and veal	9,183 (lbs.)	2	32,712 (lbs.)	11
Pork	3,022 (lbs.)	4	1,740 (lbs.)	4

When one thinks of local food products for sale, one must remember that many consumer-buyers like processed foods as well as (or oftentimes better than) fresh foods; in other words they like a change. Fresh turnip greens, therefore, compete with canned and frozen greens as well as with other green vegetables such as string beans, green limas, and green peas. Whole milk competes with other milk products. Taking more of one type of product usually leads to taking less of another.

Table 2 shows spending patterns during one week for specified foods versus competing foods by Marion County families, based on purchases of urban and rural families in the survey, June 1953. Figure 4 shows that manufacturing employment in the county is highly seasonal. The peak occurs in April and low point in December. Most of the consumption data were obtained in June when purchase might be only slightly higher than average for year due to higher employment in manufacturing.

In getting a report of food expenditures during the past year homemakers were asked about food expenses during the past month; then about differences between past month and the remainder of the past year. About 10 percent of the families reported less spent the past month, about 3 percent more, than average for past year. Most of those reporting spending less were rural families who mentioned having a lot of vegetables in the garden and not needing to spend so much. Slack employment was not mentioned.

Sources of the Family's Food

Many of the rural families in this survey carried on considerable home production, but few urban families did. Only 5 (4 percent) of the 126 urban families had used some home-produced* milk during the past year. Seventy percent of the rural families had used some home-produced milk during the report year (year preceding the interview).

There was no ordinance against keeping cows, pigs and chickens within the city limits of Columbia; but health and sanitary regulations concerning cows and pig lots were so rigid and so well enforced that there were only a few kept around the fringes of the city. There was no restriction against keeping chickens. Twenty-six percent of the urban families and 88 percent of the rural families had used some home-prdouced eggs during the report year. The percentages for urban and rural families using some home-produced broilers were lower; that is, 17 and 78, respectively.

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*"Home-produced" refers to products raised by the family on land on which the family home may or may not be located.

Table 2. Estimated total amount paid for purchased specified foods and purchased competing foods used during one week, June 1953, by urban and rural families of Marion County.

Kind of food	Urban families	Rural families	Total
	$	$	$
Whole milk	3353	1170	4523
Buttermilk	307	187	494
Other dairy foods, such as dry and canned milk, cream, cheese, ice cream (does not include butter)	2855	3096	5951
Fresh tomatoes	788	403	1191
All other types of tomatoes, such as canned tomatoes, tomato juice, tomato paste, tomato soup, tomato catsup, and tomato puree	429	679	1108
Green leafy vegetables	147	39	186
Green leafy vegetables, processed	31	0	31
All other green and yellow vegetables, fresh and processed	2134	529	2663
Sweet potatoes, cured	52	91	143
Sweet potatoes, canned	28	0	28
Irish potatoes, cured	309	122	431
Eggs	1362	490	1852
Broilers	2106	815	2921
Pork, fresh cured or salt	3779	3507	7286
Beef and veal, fresh	4957	4324	9281
All other meats including fish, other poultry, lunch meats, wieners, canned meats of pork and beef	1734	1670	3404

The use of home-produced pork and beef by urban and rural families was considerably less than that of eggs and broilers. For pork it was by 3 percent of the urban and by 65 percent of the rural families. For beef and veal it was by 2 percent of the urban and by 26 percent of the rural families.

Nearly one-third (about 30 percent) of the urban families and nearly nine-tenths (about 85 percent) of the rural families had used home-produced vegetables during the year preceding the interviews. Turnip greens was the leafy vegetable most often grown for home use. Other important leafy vegetables were collards and mustard.

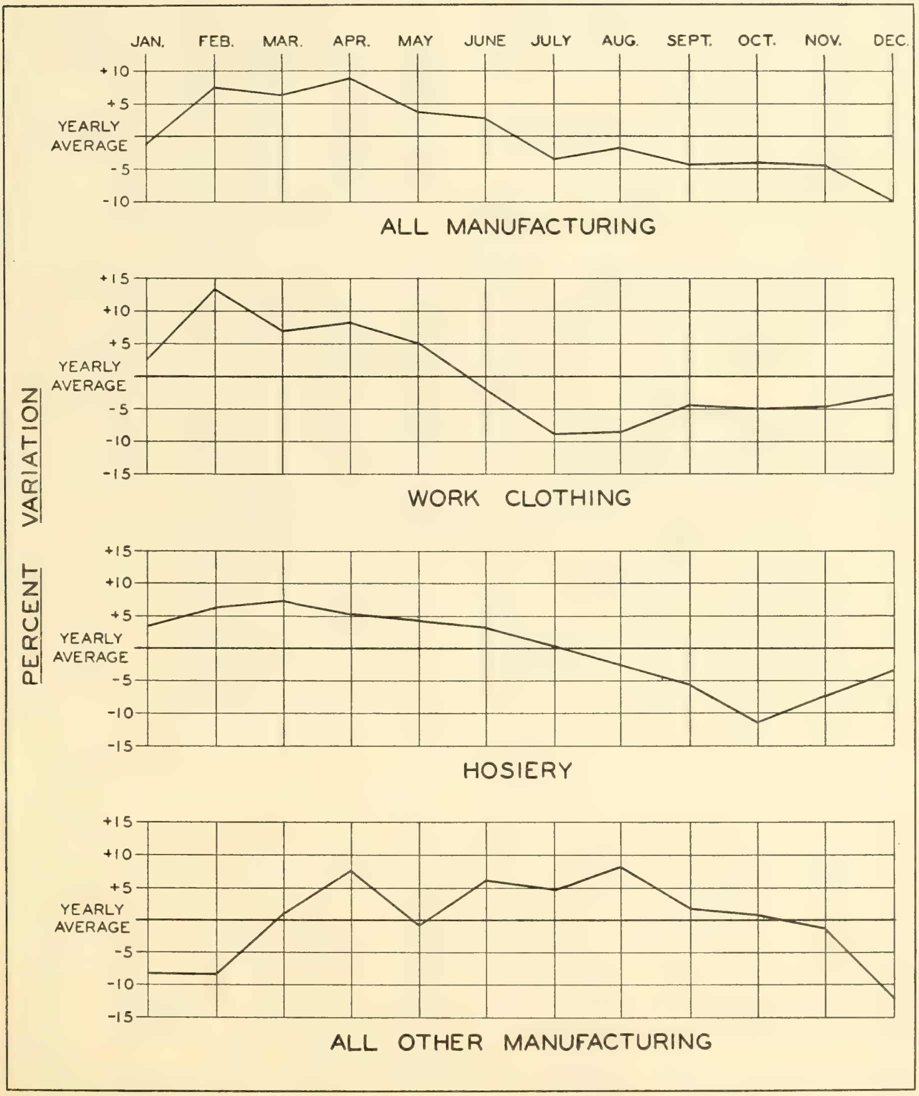

Figure 4. Average monthly variations in manufacturing employment, Marion County, 1950-53.

Most families who had a garden grew tomatoes. Sweet potatoes were considerably less important. Fifty-six percent of the rural and 8 percent of the urban families reported having used home-produced sweet potatoes during the report year.

Average amounts of home-produced foods of specified kinds used by families producing them were almost without exception larger for rural families than urban families. Rural families carried on more food processing than did urban families.

From a study of the home-produced food supplies of the urban and rural families included in this survey it seems that most urban and about one-third of the rural families depend largely on purchase for their food supply. Some families produced only a small amount of food. Many of these low producers have the philosophy of "live at home" and think little about the use of certain foods unless home-produced.

In 14 (11 percent) of the urban families and 37 (27 percent) of the rural families surveyed, the family head had shifted from farm to non-farm work. Table 3 shows changes in production for home use by urban and rural families accompanying these shifts in occupation. There were only a few urban families in the sample who had shifted from farm to non-farm work. Most had ceased production of food for home use, as would be expected. But the majority of rural families who had shifted from farm to non-farm work kept up home production. Industrial work no doubt gave income with which to purchase production facilities.

Figure 5 shows the percentage using specified foods during the report week in June and the percentage who reported home production as the source of these foods. Percentages using specified home-raised foods the past week are lower than percentages having used some of these during the previous year, since a number of families have these foods only at the peak production season. The meat and broiler percentages are, for example, considerably lower than the percentage of families having used some the previous year, due to the fact that animals killed in the Fall had been eaten in many cases. Broilers were not "ready" on some farms; tomatoes were just beginning to ripen.

During the report week there were more non-users for many of the foods listed among rural families than there were users of the home-produced product. A potential market lies in non-users (Figure 5).

Consumption Patterns

Table 4 shows total amounts of specified purchased food used during one week by urban and rural families in Marion County based on purchases of urban and rural families in the survey, June 1953.

As has been previously explained, consumption data were also obtained from some of these same families by questionnaire for one week in December 1953.

There was a significant difference in proportion of urban and rural families using purchased sweet potatoes, turnip greens and cabbage during December and June and in the proportion of rural families using purchased fresh

Table 3. Changes in production for home use accompanying shifts from farm to non-farm employment by family heads (in 11 percent of the urban and 27 percent of the rural families surveyed).

	Urban families				Rural families			
Food item	Ceased H. P.	Still produce	Never produced	Total	Ceased H. P.	Still produce	Never produced	Total
	%	%	%	%	%	%	%	%
Beef	29	7	64	100	5	30	65	100
Pork	86	7	7	100	32	65	3	100
Broilers	93	7	0	100	19	81	0	100
Eggs	86	14	0	100	16	84	0	100
Milk	86	7	7	100	24	62	14	100
Tomatoes	86	14	0	100	22	75	3	100
Turnip greens	64	36	0	100	13	84	3	100
Sweet potatoes	100	0	0	100	38	57	5	100
Cabbage	86	7	7	100	19	76	5	100

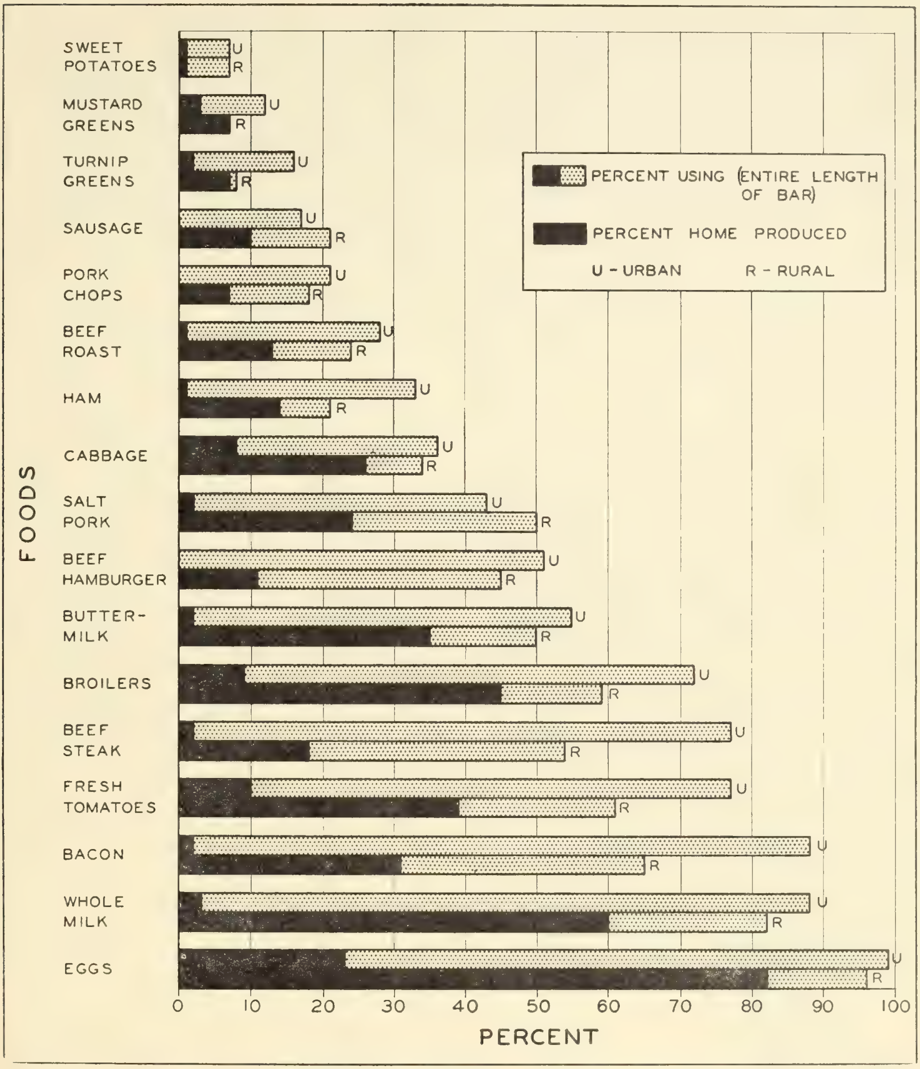

Figure 5. Percentage of rural and urban families using and producing at home specified foods during report week, June 1953.

Table 4. Estimated total amount of specified purchased foods used during one week by urban and rural families, Marion County, June 1953.

Food	Urban families	Rural families	Total
Whole milk	14,089 qts.	5,510 qts.	19,599 qts.
Buttermilk	2,278 qts.	1,711 qts.	3,989 qts.
Eggs	2,967 doz.	1,183 doz.	4,150 doz.
Broilers	3,971 no.	1,740 no	5,711 no.
Pork (no lard)	6,034 lbs.	6.235 lbs.	12,269 lbs.
Beef, veal	8,205 lbs.	8,932 lbs.	17,137 lbs.
Fresh tomatoes	3,063 lbs.	1,581 lbs.	4,644 lbs.
Sweet potatoes	321 lbs.	551 lbs.	872 lbs.
Collards	292 lbs.	116 lbs.	408 lbs.
Turnip greens	336 lbs.	29 lbs.	365 lbs.
Cabbage	752 lbs.	406 lbs.	1,158 lbs.
Mustard greens	158 lbs.	23 lbs.	181 lbs.

tomatoes in these two seasons. More of these purchased vegetables were used in December than in June.

There was likewise a significant difference in purchase of mustard greens and collards by urban families in December and June. More purchased these two leafy vegetables in December. Average amounts used by famlies using in the two periods were not very different except for fresh tomatoes which were used by both urban and rural families in larger amounts in June. Also cabbage was used by urban families in larger amounts in December than June.

There were no significant differences in percentage of urban and rural families using the other products (animal products) in the two seasons except for sausage which was used by more urban families in December than in June. There may be other seasonal differences not shown significant because of limited number of December records.

Food consumption and income level

Tables 5, 6, and 7 in the Appendix show the proportion of families using specified foods from all sources and from purchase as well as the average amounts used from all sources and from purchase by famlies who used them. The changes in proportions using from lower to higher income are greater in case of percentage buying than in percentage using. Some low income families produce these foods for home use. A few such families have these foods given to them by relatives.

Larger proportions of families in higher income groups than in the lower groups purchased animal products (whole milk, eggs, ham, broilers, beef) and tomatoes.

The local supply of tomatoes was just beginning to ripen at the time of the study (See Table 5 in Appendix). The percentages of urban families purchasing cabbage, sausage, and salt pork tended to decrease as income became greater. A similar decrease was found in purchases of salt pork by rural families.

When income was greater the average amounts of some of the foods used by families using were greater, of some less. Foods where average amounts used were greater with higher income were beef-steak, ham, fresh tomatoes, whole milk, eggs. Average amounts of salt pork used were less in the higher than lower income group.

Since non-users of these foods are important to the marketer it would be well to summarize briefly the most prevalent comments of urban and rural homemakers regarding non-use of these foods during the report week. Such a summary is included in Table 8 in the Appendix. As will be noted the principal reasons given by homemakers for non-use during the week were: (1) financial - homemaker thought food was too expensive, she couldn't afford it or she had no money; (2) use of similar or other types of foods instead, sometimes mentioning desire for change; (3) dependence on home supply—not accustomed to purchase; (4) family doesn't use or doesn't like so much; (5) food not in season or considered an inappropriate food for this time of year. A number reported that such foods were not offered at their grocery at that time, and were hard to find in the market.

Information concerning the use made of whole milk, buttermilk, tomatoes and eggs by the family was determined from each interviewee. The use made of a food product determines to a large extent the type of product which the consumer-buyer will want. Seventy-seven percent of the whole milk used by urban families and 70 percent by rural families was used as a beverage by adults and children, including some for infant feeding. Milk for drinking needs to be especially good tasting, if it is to satisfy the consumer-buyer and maintain her continued use in large quantities.

Practically all fresh tomatoes used during the report week, June 1953, were used freshly sliced, or in salads or sandwiches. Only two percent of the total amount used by rural families (none by urban families) was used in cooking. This means a demand for a firm, ripe tomato.

About two-thirds of the eggs used by both urban and rural families were used in egg dishes, such as fried eggs, scrambled eggs, poached eggs and the like. An egg dish requires an egg of higher quality than if used in cornbread, cake or a baked dish such as macaroni and cheese. Off flavors may not be detected easily in such dishes, but this is not the case with fried, scrambled or poached eggs.

Use of milk products

Records of milk products consumed at home by members of the 262 families were obtained. Milk used by each family includes not only the fluid milk but the fluid milk equivalent of evaporated, condensed, and dry milk, cream, ice cream and cheese. Conversion factors developed by the Human Nutrition Branch of the U. S. Department of Agriculture to express the nutritive value of each product as compared with fluid whole milk were used in converting milk products into equivalent quarts of fluid milk. (The factors apply only in equating the various milk products to fluid whole milk on the basis of protein and mineral content.) Quantities of milk or its equivalent recommended for different family members in the revised low-cost food plan developed by USDA home economists were used in estimating milk needs for the family.

In this survey there was not too much difference in percentage of urban and rural families having recommended amounts of milk products for families of their size and composition. (Figure 6). Fifty-nine percent of the urban and 66 percent of the rural families had amounts suggested in low cost food plans (that is 91 percent or more). But 15 percent of the urban and 18 percent of the rural families had one-half or less than suggested amounts of this important type of food. This means that one in 6 or 7 families used very small amounts of milk products.

THE MARKET SURVEY

Except for a canning plant no wholesale produce outlets were available.

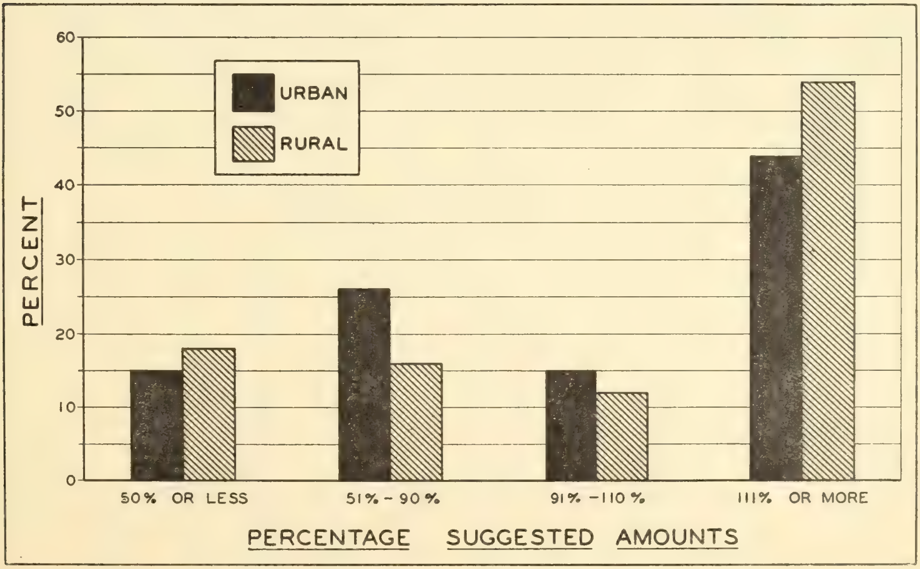

Figure 6. Percent of the 126 urban and 136 rural families using amounts of milk products during report week, June 1953, suggested in low cost plans.

The market survey was confined to food stores in Columbia. This procedure was deemed justified since there were in 1953 less than 40 such stores in the county, 26 of which were located in Columbia. Furthermore, State Tax Commission statistics indicate that since 1950 more than 92 percent of all retail sales in the county have been made by Columbia firms.

No wholesale produce outlets were available to farmers in the area. The supply of food processing facilities available to producers was limited. Plants affording such facilities in Columbia in 1953 were: (1) for dairy products, two fluid milk bottling plants and one ice cream manufacturng plant; (2) for meats, one sausage manufacturing plant, one slaughter house, one broiler processor (and egg dealer), and two frozen food lockers: (3) for vegetables, one canning plant. The abattoir did slaughtering for the local market, as well as some for locker renters and home freezer users.

Quantities and Sources of Selected Food Items Moving Through Food Stores

Purchase records of the selected products were obtained from 21 of the 26 retail food stores in June, 1953. In October 1953 records were obtained from 18 stores and in February 1954 from 16 stores. Using data obtained from these stores as a basis, estimates were made of total quantities, by sources, of the selected products moving through all Columbia food stores during each of the survey months. These estimates are shown in Table 5.

Beef: Local slaughter accounted for well over one-half of the beef moving through stores surveyed in the summer and winter months, and almost one-half (47 percent) of the total in October. Several stores bought cattle and calves at auction markets, and had them slaughtered at the local abattoir. Merchants pointed out that this practice resulted in appreciable savings in the per pound cost of carcasses over packing house prices for carcasses of equal quality. One merchant raised his own calves, or bought feeder calves and fed them to a better finish before slaughtering them for his market. Queried on comparative quality of local and shipped-in beef, one-third of the merchants interviewed gave replies indicating that plentiful supplies of commercial and lower grades of beef were available locally. They pointed out that locally-supplied beef is equal in quality to that of similar grades supplied by packers, since most packers from whom they buy obtain many of their animals from the same territory as does the local slaughterer.

Pork: Local slaughter accounted for a much smaller part of the total pork supply than was true for beef. In both June and October only about one-

Table 5. Estimated quantities of selected food items moving through retail outlets in Columbia, Mississippi, for selected months, by source of purchase.

Product	Unit	June, 1953			October, 1953			February, 1954		
		Shipped in	Local	Total	Shipped in	Local	Total	Shipped in	Local	Total
Beef	Lb.	21,303	34,052	55,355	29,980	26,540	56,520	21,672	26,160	47,832
	%	38.5	61.5	100	53.0	47.0	100	45.3	54.7	100
Pork	Lb.	23,233	3,393	26,626	31,141	4,574	35,715	25,432	6,700	32.132
	%	87.3	12.7	100	87.2	12.8	100	79.1	20.9	100
Broilers	Lb.	9,114	7,572	16,686	8,700	6,405	15,105	7,593	12,926	20,519
	%	54.6	45.4	100	57.6	42.4	100	37.0	63.0	100
Eggs	Doz.	565	5,213	5,778	3,425	1,796	5,221	962	6,028	6,990
	%	9.8	90.2	100	65.6	34.4	100	13.8	86.2	100
Milk	Qt.	—	17,518	17,518	—	20,160	20,160	—	17,165	17,165
	%	—	100	100	—	100	100	—	100	100
Tomatoes	Lb.	10,500	1,887	12,387	6,209	—	6,209	5,306	—	5,306
	%	84.8	15.2	100	100	—	100	100	—	100
Cabbage	Lb.	2,312	1,703	4,015	8,676	—	8,676	7,529	—	7,529
	%	57.6	42.4	100	100	—	100	100	—	100
T. greens	Lb.	28	67	95	—	900	900	22	984	1,006
	%	29.6	70.4	100	—	100	100	2.2	97.8	100
Collards	Lb.	—	147	147	—	334	334	—	324	324
	%	—	100	100	—	100	100	—	100	100
S. potatoes	Bu.	91	—	91	4	234	238	10	206	216
	%	100	—	100	1.5	98.5	100	4.9	95.1	100

eighth of the pork purchases reported were from local sources. In February, this ratio increased to slightly more than one in five. Pork totals shown in Table 5 include both cured and fresh pork. Approximately one-half of the pork bought from local processors was in the form of sausage. Purchases of hog carcasses locally create the problem of disposition of fat. For this reason most merchants preferred to buy fresh pork cuts from packers, though some fresh cuts were supplied by a local sausage manufacturer.

Broilers: Data indicate that one-half of the total broiler supply for the three survey months was processed locally. As may be seen from Table 5 the local supply varied from 42 percent of the total in October to 63 percent in February. While broiler production is not too important in the immediate Columbia trade area, the local processor reported that he obtained his supply of live birds from Marion and near-by counties.

Merchants' replies to questions on differences in quality and handling costs for broilers from local or other processors were equally divided between those favoring locally-processed birds, those preferring broilers from other processors, and those seeing no difference. Freshness and daily delivery, enabling stores to keep smaller stocks on hand, were the reasons most often given for the preference for locally-processed broilers.

Eggs: In June and February most of the egg supply came from local producers; in October these producers supplied only slightly more than one-third of the total eggs purchased by food stores. Most stores reported dependable sources of supply either from commercial egg producers in the area, or from the broiler processor who is also an egg dealer. Only three stores reported that they customarily bought current receipt eggs in any quantity from owners of small farm flocks. Such purchases were usually paid for in trade. Most merchants stated that local eggs were superior in quality to those shipped in, or that customers preferred locally-produced eggs even though there might be no quality difference between them and eggs from other sources.

Milk: Data indicate that the entire fluid milk supply for Columbia was provided by two local processor-distributors. These distributors, who obtain their milk from 32 Grade-A producers in the immediate area, also sell milk in neighboring towns.

At the time the survey was made there were approximately 150 Grade-A dairies in the county in addition to the 32 who supplied the local processor-distributors. Most of these producers were marketing their output through processors in either the Hattiesburg or Bogalusa, Louisiana, markets.

Tomatoes: In June, the only survey month in which tomatoes were in season locally, only 15 percent of the tomatoes sold through retail food stores were supplied by local producers. Merchants stated that customers preferred the local product, when available, over tomatoes shipped in from produce houses. More than three-fourths of those merchants selling tomatoes pointed out, however, that locally-grown tomatoes deteriorate more rapidly in the stores than do those shipped in. This they attributed to various causes, degree of ripeness when picked, diseases, and improper handling prior to marketing being the explanations most often given.

Produce buyers for some of the larger stores obtained a large part of their fresh vegetable supply from the New Orleans curb market. They reasoned that the wider selection of quality produce available there afforded them better buying opportunities and justified the added costs of weekly trips to market to select and transport their produce.

Leafy vegetables: For purposes of this study turnip and collard greens were taken as representative of the leafy vegetables which could be grown for the market in the area. As may be seen from Table 5 by far the greater part of these vegetables moving through the participating stores were supplied by local producers. Most stores had regular sources of supply, each store usually having agreements with two or three commercial growers in the area to supply their needs. Regular deliveries by these producers guaranteed both freshness and a dependable source of supply.

Cabbage was not produced commercially in the trade area to any appreciable extent. The 42 percent of the June purchases of this vegetable which came from local producers was in the main purchases of small green heads, bought by the dozen rather than on a per pound basis.

Sweet potatoes: Sixteen of the 21 stores cooperating in the study sold sweet potatoes at some time during the survey. No sweet potatoes were available locally in June, but during the fall and winter months producers in the area provide practically the entire supply. Merchants stated that potatoes bought from local producers were of better quality than the average which was shipped in. They also said that they had less loss from rot in the local product. They further stated that by buying locally they could inspect the product before purchase, and thus be assured of sweet potatoes that had been properly washed and graded.

HOW INDUSTRY HAS HELPED THE SALE OF LOCAL FOOD PRODUCTS

Marion County, with its history of manufacturing industry since the thirties or earlier, has had more opportunity to develop outlets for farm products than many similar cities where such industry is of recent origin. When food retailers were questioned about problems in connection with buying food locally, very few were mentioned. Most of these merchants seemed able to obtain what they wanted locally and were in the main satisfied with the quality of the products available. Nor did farmers report many problems in connection with selling. Their real complaint against the market was low prices—not a problem confined to the Columbia area.

Local products as has been shown in Table 5 were being sold in large quantities by Columbia food retailers. Many of these products were purchased from local processors, i.e., the milk bottling plants, the ice cream manufacturing plant, the broiler processor and egg distributor, the abattoir, the sausage factory, the canning plant. But there was buying by merchants from farmers too; especially of eggs and produce. Such buying and selling was often on a contract basis with farmers agreeing to furnish specified amounts of the product at certain intervals rather than "hit or miss" buying and selling as was found to be the case in a recently industrialized area of a similar type. It may be that contracts of farmers with the canning plant have helped pave the way for contracts between farmers and retailers.

POSSIBILITIES FOR INCREASED BENEFITS FROM INDUSTRY TO LOCAL FARMERS

From an analysis of data from food handlers, consumers, and farmers, it would seem that food handlers, farmers, and other leaders in the county might bring about greater benefit to the farmer from industry first by studying the food processing facilities in the county and making plans for additional ones where desirable. It has been shown that it is mainly through such facilities that local products get to consumers. It might well be that one very thoughtful Marion County farmer was right when he said, "We need a wholesale produce market in this county, also a shipping shed. I have had experience in another county and see that it could be done here."

In the second place, county leaders might well take better advantage of the present situation. Taking better advantage of this situation will involve first of all helping farmers expand cattle and hog production. There are possibilities of increased sale of local meat through the present facilities as well as possibilities in sales to consumers for lockers and home freezers. There is also a possibility for expansion of commercial egg enterprises. Those with small farm flocks might increase the size of production of their flocks. But if increased production from such flocks is to be marketed emphasis must be placed on proper handling and marketing practices so that eggs will be of good quality when they reach the market.

Taking advantage of the present situation will mean more effective cooperation between food handlers and home economists. About one in every six of the survey families had less than half of the amounts of dairy products suggested in food plans for families of their size and composition. Yet local milk plants and local dairy farmers go outside Marion County to dispose of part of their milk. It is well that this market is available. Increasing emphasis needs, however, to be given to more sales of milk within the county.

Also, many families need help in how best to supplement the home supply by purchase. Home economists working with retailers can be of assistance to such families.

Taking better advantage of the present situation would in the third place involve close coordination of farmers and food handlers. Marion County consumers like a wide choice of foods in various forms. But total amount of food that can be used by a particular family is limited. An increase in use of one kind may lead to a decrease in use of another. Retail grocers might well serve farmers by keeping them posted as to trends in sales of the various foods.

There is also some long-time planning that food handlers, farmers, and other leaders in the county should be doing now. The family survey showed that higher income families used increasing amounts of animal food products, such as beef, broilers, eggs, milk. Long-time plans might well be made whereby local producers will get benefits from this greater demand.

SUMMARY

Data for this report were obtained in June 1953 from a survey of 126 families in Columbia and 136 families in rural areas within a 10-mile radius of the city and from most of the food stores in Columbia where the majority of Marion County families traded.

Income per capita for Marion County families, based on incomes of urban and rural families in the survey during 1952-53 was $597.

Average per capita food expenditures for Marion County based on expenditures of families in the survey was $139, or 23% of the income.

Only 11 of the 136 rural families did not mention a Columbia grocery store when asked to report grocery stores where traded. Urban families traded around somewhat more than rural families and had traded a shorter time with the groceries named.

The wife (or female head) was the person who most often shopped for food either with or without assistance of husband or others. But men in relatively more rural than urban families shopped for food or assisted in shopping.

Eggs was the food most often purchased direct from producers. The majority of families included in the survey did not buy any of the eight kinds of foods being studied (i.e., milk, beef, pork, broilers, eggs, sweet potatoes, tomatoes and leafy vegetables) this way. Inconvenience and absence of (or limited) marketing services were the reasons most often given.

A few families both urban and rural purchased beef and pork from farmers to put in the home freezer or community locker. This practice may increase in the future provided consumers are satisfied with the meat thus purchased.

A comparison of amounts spent for specified foods and foods that competed with them showed large expenditures for competing products. Marion County consumers like many kinds and forms of food. Farmers in Marion County need to study changes in kinds of foods sold at food stores in the county as a basis for planning farm production programs.

Most urban families and about one-third of the rural families depended largely on purchase for their food supply.

Whether families continued in production for home use after the family head shifted from the main occupation of farming to non-farming depended on residence. The great majority of those who moved to Columbia ceased home production; but the majority in the rural areas continued home production.

When consumption of specified foods during June is compared with similar data during December, greatest seasonal variation was in types of vegetables used during the two seasons.

Increases in the proportion of families purchasing from lower to higher income group were greatest for animal products (i.e., beef, broilers, milk.)

Principal reasons given for non-use of the specified food were: (1) financial; (2) use of similar or other types of food; (3) dependence on home supply; (4) not liking the food; (5) food not in season (or considered not in season).

Much of the beef, broilers, eggs, milk and vegetables when in season handled by food retailers of Columbia was locally produced.

APPENDIX TABLES

Table 1. Yearly average employment, total payrolls, and average wage paid per worker in non-farm industries, Marion County, Mississippi, 1950-53.

INDUSTRY GROUP	AVERAGE EMPLOYMENT			
	1950	1951	1952	1953
Manufacturing:				
Food Products	153	119	149	146
Textiles	49	50	55	49
Apparel	600	867	797	655
Lumber and Wood Products	470	369	282	293
Printing and Publishing	13	12	11	11
Chemical Products	201	170	163	154
Stone Products	11	9	11	19
Fabricated Metal Products	13	13	2	0
All manufacturing	1510	1609	1470	1327
Service Industries	1152	1394	1269	1270
Total Non-farm	2662	3003	2739	2597

INDUSTRY GROUP	TOTAL PAYROLLS			
	1950	1951	1952	1953
Manufacturing:				
Food Products	$ 199,537	$ 165,036	$ 206,581	$ 200,182
Textiles	167,665	180,647	176,947	175,026
Apparel	1,203,373	1,662,677	1,677,728	1,492,719
Lumber and Wood Products	687,847	603,061	508,634	531,666
Printing and Publishing	27,649	31,332	35,577	35,420
Chemical Products	483,004	456,917	405,504	475,381
Stone Products	22,427	20,313	35,001	55,501
Fabricated Metal Products	22,166	27,047	3,383	0
All manufacturing	$2,813,667	$3,147,030	$3,053,355	$2,897,895
Service Industries	2,460,474	3,766,254	3,718,935	3,364,191
Total Non-farm	$5,274,141	$6,913,284	$6,772,290	$6,262,086

INDUSTRY GROUP	AVERAGE WAGE PAID PER WORKER			
	1950	1951	1952	1953
Manufacturing:				
Food Products	$1304	$1387	$1386	$1371
Textiles	3422	3613	3217	3572
Apparel	2006	1918	2105	2279
Lumber and Wood Products	1464	1634	1804	1815
Printing and Publishing	2127	2611	3234	3220
Chemical Products	2403	2688	2512	2645
Stone Products	2039	2257	3182	2921
Fabricated Metal Products	1705	2081	1692	0
All manufacturing	$1863	$1956	$2077	$2184
Service Industries	2136	2702	2931	2649
Total Non-farm	$1981	$2302	$2473	$2411

Source: Mississippi Employment Security Commission. **Monthly Employment and Quarterly Wages of Workers Covered by the Mississippi Employment Security Law, By County, By Industry, for the Calendar Years 1950-53.**

Table 2. Estimates of total and per capita spendable incomes, Marion County, Mississippi, 1944-53, and comparisons with Mississippi per capita incomes.*

Year	Total dollars	Marion County per capita dollars	Mississippi per capita dollars
1953	15,583,000	651	834
1952	15,500,000	647	826
1951	15,918,000	664	775
1950	15,608,000	651	702
1949	13,204,000	551	638
1948	16,130,000	672	737
1947	14,693,000	612	652
1946	13,178,000	549	574
1945	14,423,000	600	589
1944	11,326,000	471	579

*Computed from State Sales Tax collection data and based on the assumption that food sales in Marion County bear the same relationship to spendable incomes in that county as do food sales in the state to state spendable incomes. Per capita estimates for Mississippi are those published annually by the United States Department of Commerce.

Table 3. Total and per capita expenditures for food through retail outlets, Marion County, Mississippi, 1944-53.

Year	Current dollars		1935-39 dollars	
	Total	Per capita	Total	Per capita
1953	3,328,462	139	1,472,771	62
1952	3,264,361	136	1,444,408	60
1951	3,253,572	136	1,433,292	60
1950	2,954,652	123	1,448,359	60
1949	2,817,760	118	1,345,921	56
1948	3,035,733	127	1,445,587	60
1947	2,769,544	115	1,427,600	59
1946	2,501,242	104	1,563,276	65
1945	2,194,252	91	1,578,599	66
1944	1,592,675	66	1,171,085	49

Source: State Tax Commission published data on retail food sales (col. 1) divided by county population estimates for each year to obtain per capita expenditures (col. 2). This data converted to 1935-39 prices by applying B. L. S. index of all food prices to data in col. 1.

Table 4. Volume of taxable retail sales, by industry groups, Marion County, 1944-54.

Year	Total retail	Food	Furniture and fixtures	Apparel and general merchandise	Automotive	Building	Miscellaneous retail	All other**
				Dollars				
1954	17,077,947	3,499,956	501,961	3,289,842	3,335,682	3,979,787	1,620,068	850,651
1953	20,104,086	3,328,462	522,903	3,498,740	3,676,410	6,408,111	1,840,967	828,493
1952	19,335,465	3,264,361	766,822	3,906,419	3,627,452	5,446,428	1,381,194	942,789
1951	17,242,858	3,253,572	607,870	3,723,927	3,736,012	3,836,798	1,106,406	978,273
1950	14,947,231	2,954,652	335,345	2,604,152	3,450,124	3,849,809	1,189,697	563,452
1949	14,844,791	2,817,760	246,093	2,441,425	3,038,333	4,768,962	940,450	591,768
1948	14,702,320	3,035,733	149,272	2,823,287	2,963,838	4,216,594	707,726	805,870
1947	12,572,820	2,769,544	170,280	2,736,345	2,460,195	2,976,958	798,130	661,368
1946	10,351,316	2,501,242	144,935	3,221,829	1,740,292	1,499,395	1,195,570*	48,053
1945	8,259,999	2,194,252	166,174	2,515,213	998,679	1,160,223	1,186,043*	39,415
1944	6,570,362	1,592,675	85,988	2,365,465	809,884	806,879	909,471*	

Source: Mississippi State Tax Commission Service Bulletins No. 29, 31, 33, 35, 37, 39, 41, 43, 45, 46 and 49.

*Includes miscellaneous services.

**1945 and 1946 data include only natural resources; later years include natural resources and miscellaneous services.

Table 5. Percentage of urban and rural families using specified foods from any of one or more sources (bought, home-produced, gifts) and from purchase only by income group during report week in June, 1953.

Foods	Percent who used any from one or more sources								Percent who used bought only							
	Urban				Rural				Urban				Rural			
	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over
Cabbage	50	35	50	22	39	19	43	29	20	24	18	5	2	0	8	0
Mustard greens	20	29	9	5	12	6	5	0	5	12	9	4	0	0	3	0
Turnip greens	20	35	6	15	8	8	5	14	5	29	6	11	0	0	3	0
Beef roast	5	6	26	44	16	17	38	29	5	6	24	44	4	6	14	0
Hamburger	35	41	50	60	33	56	49	50	35	35	50	60	24	42	35	29
Beef steak	25	76	76	96	41	42	78	71	25	71	71	95	27	19	51	43
Bacon	70	82	91	95	57	58	78	79	65	71	88	95	14	39	46	57
Pork chops	25	29	15	20	6	19	22	50	25	29	15	20	2	14	11	36
Sausage	15	35	21	9	18	22	24	14	15	35	21	9	8	11	11	7
Ham	5	18	26	53	12	19	32	29	0	12	21	51	0	6	8	21
Salt pork	55	59	32	40	51	39	62	43	50	41	32	38	22	25	35	14
Broilers	65	65	76	75	55	50	70	64	35	53	68	71	4	17	16	36
Eggs	95	100	100	98	98	92	97	93	45	53	82	85	6	8	19	29
Whole milk	70	71	97	95	78	67	97	93	60	71	97	91	6	14	32	36
Buttermilk	65	71	59	44	51	36	51	79	45	71	47	42	10	6	14	29
Sweet potatoes	5	0	9	9	2	11	11	7	0	0	9	7	2	8	8	7
Fresh tomatoes	60	41	76	95	51	56	73	79	30	29	56	78	6	17	19	50
Total families	20	17	34	55	49	36	37	14	20	17	34	55	49	36	37	14

Table 6. Average amount specified purchased foods used by urban and rural families using during report week, June 1953, by income group.

	Urban families				Rural families			
Foods	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over
Beef steak, lbs.	1.20	2.83	2.60	2.74	1.73	2.79	2.57	2.75
Beef roast, lbs.	2.00	3.00	3.78	3.58	2.50	3.00	3.10	0
Beef hamburger, lbs.	1.43	1 58	1.63	1.74	2.00	1.77	2.00	2.12
Broilers, lbs.	2.93	3.42	3.78	3.43	4.00	3.42	2.58	3.20
Sausage, lbs.	1.34	1.33	1.32	1.40	1.44	2.00	1.75	1.00
Ham, lbs.	0	1.00	1.17	1.82	0	3.5	1.33	2.67
Salt pork, lbs.	1.25	1.36	1.68	.98	1.50	1.56	1.58	.38
Bacon, lbs.	1.27	1.58	1.73	1.88	1.50	1.71	1.91	2.06
Pork chops, lbs.	1.60	.63	1.70	1.57	1.50	1.60	1.38	2.50
Fresh tomatoes, lbs.	1.33	2.40	2.20	3.44	1.17	2.50	2.71	2.43
Sweet potatoes, lbs.	0	0	2.33	3.75	.50	2.83	2.67	2.00
Cabbage, lbs.	1.62	4.50	3.00	3.00	2.00	0	4.00	0
Mustard, lbs.	1.66	.83	1.66	1.25	0	0	.83	0
Turnip greens, lbs.	2.00	1.40	2.50	1.50	0	0	1.00	0
Whole milk, qts.	4.50	6.25	9.24	10.62	3.30	5.20	8.83	9.60
Buttermilk, qts.	2.22	2.70	3.25	2.20	3.20	2.00	5.00	3.50
Eggs, doz.	1.28	1.94	1.98	2.52	1.0	3.33	2.81	2.02
No. families	20	17	34	55	49	36	14	20

Table 7. Average amount specified foods used (all sources) by urban and rural families using during report week, June, 1953, by income group.

	Urban families				Rural families			
Food	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over	$1170 and under	$1171 to $2210	$2211 to $3810	$3811 and over
Cabbage, lbs.	1.95	5.67	2.53	2.88	3.47	6.57	3.66	2.75
Mustard, lbs.	1.37	1.00	1.66	1.38	1.75	1.83	.92	0
Turnip greens, lbs.	1.50	1.33	2.50	1.50	2.25	2.67	2.50	1.50
Beef roast, lbs.	2.00	3.00	3.08	3.58	3.50	2.83	3.50	4.00
Hamburger, lbs.	1.43	1.64	1.63	1.74	2.31	1.88	1.92	2.00
Beef steak, lbs.	1.20	2.77	2.63	2.78	2.33	3.10	2.54	3.65
Bacon, lbs.	1.25	1.57	1.71	1.88	1.77	1.71	2.03	2.04
Pork chops, lbs.	1.60	.63	1.70	1.57	2.33	1.71	1.69	2.36
Sausage, lbs.	1.34	1.33	1.32	1.40	1.53	1.94	1.61	1.50
Ham, lbs.	2.50	1.67	1.83	1.83	1.12	2.21	1.88	2.50
Salt pork, lbs.	1.32	1.20	1.68	.94	1.56	1.61	1.50	.79
Broilers, lbs.	3.88	3.25	3.73	3.37	5.51	4.78	4.10	3.50
Eggs, doz.	1.42	1.82	1.97	2.42	2.67	2.49	3.03	2.81
Whole milk, qts.	5.00	6.25	9.52	11.02	13.30	15.83	11.42	11.12
Buttermilk, qts.	3.20	2.70	3.10	2.17	5.52	5.69	4.13	3.23
Sweet potatoes, lbs.	2.00	0	2.33	3.80	.50	3.38	2.75	2.00
Fresh tomatoes, lbs.	1.92	2.71	2.53	3.49	5.12	4.25	4.57	2.91
No. families	20	17	34	55	49	36	37	14

Table 8. Reasons most often given by homemakers for non-use of specified food during report week, June, 1953 (listed in order of importance).

FOOD	URBAN	RURAL
Whole milk	Don't drink; only cook with. No money, costs too much. Use or like competing milk drinks.	No money; costs too much. Don't drink; only cook with. Cows dry.
Buttermilk	Use or like competing dairy product. Don't like so well.	Use or like to use competing dairy product. Don't like.
Broilers	Used other kinds of meats or cuts.	Chickens not ready to eat. Used other kinds of meat.
Eggs	No money, costs too much.	Hens didn't lay. No money, costs too much.
Ham	No money, costs too much. Used other meats or cuts instead.	No money, costs too much. Used other meats and cuts. Home supply used up.
Pork chops	Not in season. No money, costs too much. Not good for you.	Not in season. Home supply used up. No money, costs too much.
Bacon	No money, costs too much. Used other things instead.	No money, costs too much. Home supply used up. Used other things instead.
Sausage	Not in season. No money, costs too much. Don't like so much.	Not in season. Home supply used up. Used other kinds of meat.
Fresh tomatoes	No money, costs too much. Can't find any good ones.	Mine not ripe yet. No money, costs too much.
Cabbage	Used other vegetables instead. Don't like so much.	None in garden. Used other vegetables.
Turnip greens	Used other vegetables. Not in season now; hard to find.	None in garden. Not in season. Used other kinds of vegetables.
Beef steak	No money, costs too much. Used other kinds of meat.	No money, costs too much. Used other kinds of meat.
Beef roast	Used other kinds of meat. No money, costs too much.	No money, costs too much. Used other kinds of meat.
Hamburger steak	Used other kinds of meat. Don't like too much. No money, costs too much.	Used other kinds of meat. No money, costs too much.
Mustard greens	None in grocery store. Had other kinds of vegetables. Not in season.	None in garden. Not in season. Used other kinds of vegetables.
Sweet potatoes	None in grocery store. No money, costs too much. Don't like much.	Home supply used up. None in grocery store. Used other foods instead.

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Grain Storage and Marketing Facilities in Mississippi

MISSISSIPPI STATE COLLEGE

AGRICULTURAL EXPERIMENT STATION

CLAY LYLE, Director

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Grain Storage and Marketing Facilities In Mississippi

By

TRAVIS D. PHILLIPS

INTRODUCTION

Farmers of Mississippi have been undergoing a far-reaching agricultural adjustment characterized by dynamic and better-balanced systems of farming. The more important reasons for these changes have been price support and acreage control programs for certain crops, improved markets, technological developments, changing price levels, and a fuller realization of the advantages associated with balanced-farming programs.

Shifts in Sources of Cash Farm Income

A good indication of the nature and significance of the changes which have occurred has been the shift in the relative importance of different farm enterprises as sources of cash farm income (Appendix Table 1). Distinct trends disclose changes of a permanent nature which are leading to a better balance among the agricultural enterprises. Associated with these trends, however, have been highly irregular fluctuations which bear evidence of the impact of such forces as major technological innovations, changing price levels, and government programs.

The most significant of the trends, since World War I, has been the marked increase in the relative importance of livestock and livestock products as sources of cash farm income. This increase has been offset in part by the decline in the relative importance of cotton and cottonseed. Less significant, but of great importance from the standpoint of increased total income, have been the slight relative increases in the grain crops, including soybeans.

The relative changes need to be appraised in terms of changes that have occurred in absolute income. For example, during the years 1924-28 cotton and cottonseed accounted for 77 percent of the total farm income while having an annual average cash value of only $166 million. In contrast, these two products, in 1949-53, accounted for only 64 percent of the total farm income while having a much higher annual average cash value of $350 million. The extent of absolute changes in income and of irregular fluctuations is shown in Appendix Table 2.

A study of grain marketing necessarily leads to a closer examination of changes in both the relative and absolute importance of these crops. The reasons for these changes should also be noted in order to understand the significance of the trends toward grain production.

In 1942, the soybean crop in Mississippi, which had never before returned an annual income as great as three-fourth million dollars, exceeded $3 million in value. The primary causes of this tremendous increase were, first, farmers were faced with acute labor shortages and turned to soybeans as a high-value, low-labor requirement, alternative enterprise; and, second, the government support price of soybeans was relatively favorable. Since 1942, the income from soybeans has never dropped below $1.5 million. However, annual income from this source has fluctuated widely as a result of cotton acreage control programs, recurrent labor shortages, highly variable per-acre yields, and varying soybean prices.

This expansion in soybean production was dependent upon the availability of marketing and processing facilities. The facilities used for processing cottonseed have been readily adaptable to soybean crushing, and, in the face of declining cottonseed production, cottonseed crushers have been eager to get the soybeans.

The total for other grain crops (corn, oats, wheat, barley, rice) equaled soybeans as a source of cash farm income during the period 1949-53. The increase in importance of these other grains has been less spectacular than for soybeans. In the decade just following World War I, farmers in Mississippi produced little more than enough grain for home consumption requirements. As tractors replaced workstock, grain production was maintained at about the same levels, and more grain was moved through commercial channels.

In more recent years production of grain has been increased, primarily as a result of changing livestock management practices. Large acreages of small grains have been planted for winter grazing. Proper management of these winter grazing crops has made it possible for the farmer to harvest grain which can either be sold or fed to livestock. Paralleling this increase in small grain production has been an expanding requirement for grain as feed for the rapidly growing poultry and dairy enterprises.

The Grain Storage Situation

Commercial production of corn, oats, wheat, barley, and rice expanded less rapidly than soybeans because facilities for handling these grains were limited. Miley described conditions as late as 1943 as:

> In recent years three small grain elevators have been operating in the Delta, two at Greenville and the other at Inverness. The operators of these elevators buy grain outright or store in on a fee basis for the producers. The operators of these elevators have not found the demand for their services sufficient to expand their operations materially. The outlets for the oats they buy are rather limited, since they have not been able to compete successfully in the out-of-state markets in the South with the oats shipped in from other areas.[1]

The situation described by Miley partially explains the slow growth of commercial grain production. Business firms hesitated to invest in expensive facilities because of the uncertain demand for these facilities. Farmers, on the other hand, preferred to allocate their productive resources to farm enterprises for which market outlets were readily available.

Since 1943, facilities for marketing grain have been increased. Severely depressed prices at harvest time indicate that construction of facilities has lagged behind production increases. In years when soybean prices have been at, or near, the support level, the confusion resulting from inadequate facilities has been more evident. Farmers tend to use storage facilities for soybeans and dump their other grains on the market. The grains become, in effect, distress merchandise and sell at prices well below support levels.

Purpose and Method of Study

This study was initiated to obtain information for Mississippi on the adequacy, practices, services, and charges for the storage of commercial crops, other than cotton lint. The present study makes available information needed for a better understanding of production and utilization trends and seasonal price fluctuations. A description of the over-all situation is necessary in order that farmers may examine the alternatives in grain production and in marketing their surpluses, and that business firms interested in investments in the marketing process can help to adjust facilities to production.

An inventory of present storage facilities, both commercially and on-the-farm, was necessary. This information was obtained by personal interviews. All of the operators and/or owners of commercial elevators were interviewed to obtain data on capacities, charges, services, and practices in the normal operation of the facilities. Estimates of the capacity of on-the-farm storage facilities and production trends were obtained by a complete survey of the county extension and Agricultural Stabilization and Conservation personnel in each county. As a check against the capacity of storage facilities, supplementary material was obtained from the State ASC office.

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[1] Miley, D Gray, **Commercial Agricultural Production and Marketing Methods and Facilities in Mississippi**, Mississippi Agricultural Experiment Station Bulletin 394, October, 1943, pp. 87-88.

Production trends of the grain crops were developed from data available in reports of the Mississippi Crop and Livestock Reporting Service, from other secondary materials, and, as mentioned above, from estimates by county extension agents.

A section of this report was developed to indicate present and potential uses of Mississippi feed grains. Interviews with feed mill operators were made to determine the volume of grain moving through the feed mills the previous year and to study the grain movement between Mississippi and other areas. However, because of the short time some of the mills have been in operation and due to the seasonality of the feed mill business, records were often inadequate. Therefore, the major part of the section on utilization was developed from sceondary material.

The information on seasonal prices and storage costs was assembled largely from secondary sources. Storage costs have been limited to the charges by commercial elevators and to the cost of permanent structures on the farm.

The findings resulting from the survey of the capacity of facilities are presented in the section on storage facilities. Storage capacities were contrasted with the volume of grain placed in the Commodity Credit Corporation loan during 1954 to give some measure of the adequacy as far as capacity was concerned. Conclusions derived from the various segments of the study have been summarized in the final section.

GRAIN PRODUCTION

The combined acreages of the grain crops (corn, oats, wheat, barley, rice, soybeans) in Mississippi have usually been about equal to the acreage of cotton. Figure 1 shows that the long-time trend in corn acreage has been downward, while in Figures 2, 3, 4, and 5, the trends for the other grain

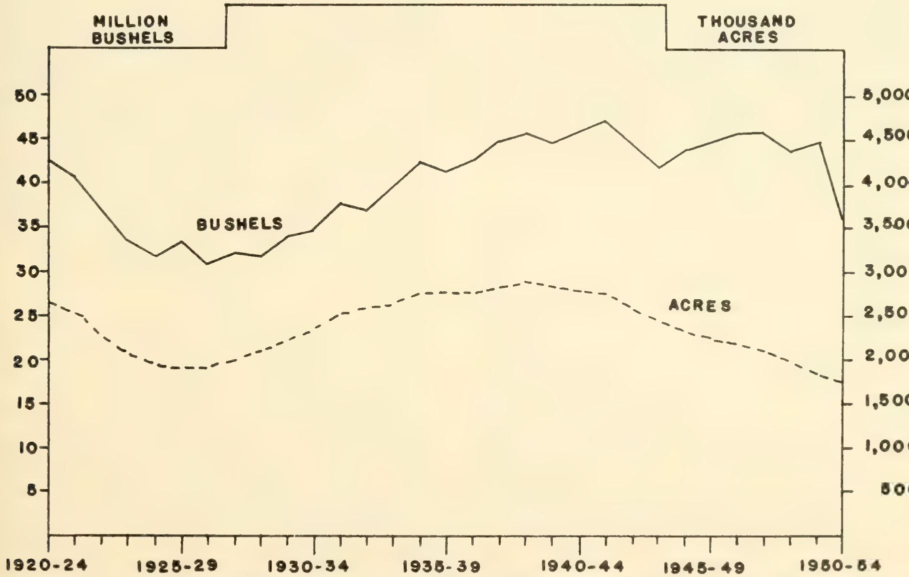

Figure 1. Five-year moving averages of corn acreage and production in Mississippi, 1920-54.
Source: See original data in Appendix Table 3.

crops have been definitely upward. The figures on other grains mentioned above, except for rice, do not reflect the full significance of the 1953-54 acreage trends, which have increased much faster than the five-year averages indicated.

With the possible exception of corn, there has been a definite increase in the production of each of the grain crops. The declining acreage of corn has been offset in part by increased yield per acre, so that total production has tended to remain fairly constant.

In this section of the report, past production, factors affecting changes in production, and probable future production have been analyzed for each crop.

Corn

Mississippi has never been a very important commercial corn-producing state. Corn has always been produced primarily for home consumption.[2] Figure 1 indicates that a fairly constant amount of corn has been required over the past 35 years. As the acreage of corn has decreased, yields have increased to maintain a relatively constant total production.

Even though corn-consuming livestock enterprises have just about doubled in the last 30 years (Appendix Table 1), the total production of corn has not changed materially. This was probably made possible by the sharp decline in workstock as farmers shifted to modern machinery as a source of farm power, and by the transition in the meat animals from large animals carrying a great deal of waste fat to smaller, more compact animals. Also these smaller meat animals have required less feed for body maintenance.

Technology within the last 35 years has increased corn yields in Mississippi about 35 to 40 percent. However, the state's average corn yield per acre still lags behind the United States average by about the same relative amount. Corn production has been dependent greatly upon climatic conditions, rainfall in particular. Drought has reduced drastically the yield through the period 1951-54. Technological advances, such as the introduction of hybrids, fertilization, and new cultural methods, have been instrumental in achieving these increases and are capable of pushing yields much higher in the future.

Corn yield in the future will depend upon how far this technology is pushed. The corn acreage probably will depend upon governmental action to control basic commodity prices. However, insofar as such restrictions are imposed, the production of corn should at least hold its present level, or probably show some increase.

Certain livestock enterprises may exert pressure on corn production in the future in Mississippi. There seems to be a growing interest in the possibilities of feeding out beef calves on the farms in the South instead of shipping them to the Corn Belt. Broiler production has caused more consideration to be given to home-produced corn. A survey in Scott County, a heavy broiler-producing area, indicated that approximately a million bushels of shelled corn were brought into the county from sources outside of Mississippi during 1953.[3] Lack of processing equipment and storage facilities, together with the fact that enough locally-produced corn was not available, accounted for the heavy in-shipments into Mississippi's greatest broiler-producing county. The development of feed mills which can produce formula feeds at prices below those normally paid should stimulate corn production on livestock-producing farms.

Oats

Oats were formerly planted in the South as feed for workstock. In 1943, Miley stated that:

> Oat production was started in the Delta as a means of producing feed for workstock, and are still planted mainly for that purpose; but in recent years there has been a considerable increase in commercial oat production.[4]

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[2] Miley, **Op. Cit.**, p. 87.

[3] From a survey made by the Scott County extension personnel in January, 1954, to determine the amount of corn for poultry feed utilized by the feed mills in 1953.

[4] Miley, **Op. Cit.**, p. 87.

Since Miley's study was made, oat production reached new peaks in 1944 and 1945 followed by a falling off of production in the postwar years. Production during 1953 and 1954 has risen back to the 1944 and 1945 level. Workstock have been disappearing as consumers of oats but are being replaced rapidly by cattle and poultry.

Oat yields have by no means been stable; however, there has been a steady increase. During the past 35 years the yields have about doubled with no indications of leveling off (Appendix Table 4).

The oat crop has been one of the more popular of the small grains planted for winter grazing. Yields have tended to increase, even with grazing, provided the animals were removed at the proper time.

The emphasis on winter grazing, as well as being a solution to the labor shortage, has probably accounted for the popularity of the crop since about 1940. The ease with which the crop can be stored for CCC loans may influence production as long as the support levels are high.

The amount of oats harvested for grain may be influenced materially by the growing tendency to cut the entire plant in the dough stage for hay. This has been especially true in the upland areas of Mississippi where a great many dairy cattle are found. Cutting the entire plant has eliminated the necessity for combines and facilitated storage as well as provided roughage along with the grain for the cattle. Feed mills which grind this baled oat hay and add the desired concentrates have been responsible to a large extent for this change in the method of harvest.

Indications are that oat production will continue at a high level as long as no restrictions are placed on the acreage. The level of support prices will also be a determinant factor. Lack of storage facilities which meet the CCC standards for loans may influence the amount of production, if market prices fall far below support prices.

Usually oats and corn are fed together—the amount of each depending upon the relative price of the two crops. Therefore, oats would also be in demand for feeder calves in the event a feeding program were initiated in Mississippi.

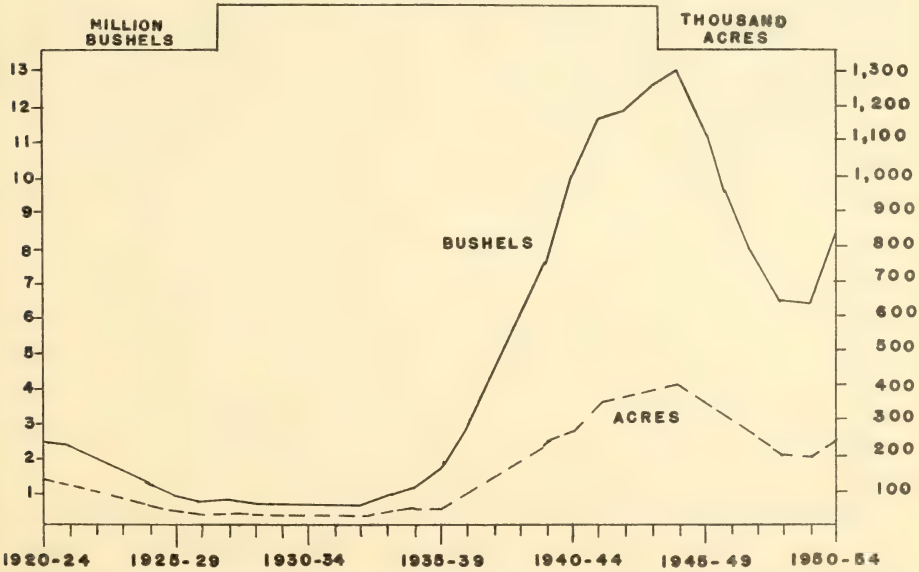

Figure 2. Five-year moving averages of oat acreage and production in Mississippi, 1920-54. Source: See original data in Appendix Table 4.

Soybeans

Soybeans harvested for beans became of importance during World War II. The critical shortage of vegetable oils for war purposes necessitated the imposition of government price supports. A sharp increase in soybean production resulted (Figure 3).

The production of soybeans increased through the war years but dropped back almost to prewar levels after the war. However, beginning with 1948, there has been a rapid increase in the acreage planted in soybeans, with the exception of 1953.

The low level of yields in some years has been a major setback to the crop, Table 1. Since Mississippi has produced such a small part of the total crop in the United States. local fluctuations in production probably have had little influence on prices. Also, cottonseed, a close substitute for soybeans, have been accumulated by the CCC and have tended to act as a price ceiling over soybeans. For these reasons, soybeans have not always been too dependable as the sole source of farm income.

Technology has advanced the yield of soybeans on the average but has done little to keep yields consistent from one year to the next. These fluctuations are not revealed in Figure 3 because the five-year moving averages have tended to smooth out the extremes; but statistics for individual years give a better idea of just how uncertain the crop has been in Mississippi, Table 1.

Table 1. Soybean acreage, yield, and production in Mississippi, 1949-54.

Year	Acres (1,000)	Yield (Bu./A.)	Production (1,000 bu.)
1949	103	16.5	1,782
1950	358	25.0	8,950
1951	425	13.0	5,525
1952	455	13.5	6,142
1953	250	12.0	3,000
1954	519	9.5	4,930
Average	352	14.9	5,055

Source: **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1951-53; **Crop Production—1954, Annual Summary,** Agricultural Marketing Service, Crop Reporting Board, United States Department of Agriculture, Washington, D. C.

The increase in soybean production in Mississippi beginning in the early war years may be accounted for in several ways. Probably one of the more important reasons was the shortage of

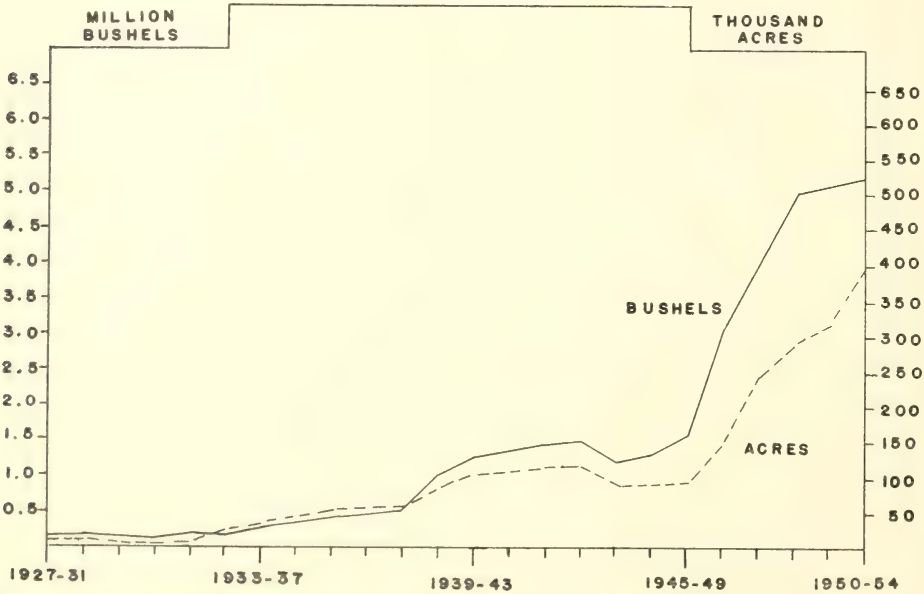

Figure 3. Five-year moving averages of soybean acreage and production in Mississippi, 1927-54.
Source: See original data in Appendix Table 5.

vegetable oils which caused the price of soybeans to rise sharply. Labor shortages during the war forced farmers to turn to crops which required less man-hours. Where labor created a problem, soybeans substituted for cotton as a cash crop. Cotton acreage restrictions after the war have had a significant effect on the soybean acreage.

After World War II the soybean acreage in Mississippi declined for two major reasons. First, labor was not as scarce in the postwar years as it had been during the war period. Second, soybean price supports were eliminated when vegetable oils were no longer needed for military purposes. Table 2 gives some indications of how the price of soybeans changed relative to cotton and cottonseed when the supports on soybeans were removed after the war as compared to the support period during the war. After the war with a more abundant labor supply available, farmers were able to turn from lower-priced soybeans to more favorably-priced crops such as cotton.

The trend in the production of soybeans has been sharply upward in recent years following the decreased emphasis on the crop immediately after the war. Perhaps this increased interest can be explained by the method by which cottonseed and soybean prices have been supported. Cottonseed and soybeans have competed with each other from the planting of the seed all the way to oil and meal products. Competition for production has not stopped at the farm level, as both cottonseed and soybeans begin their initial processing through the same facilities—the oil mills. The products from this processing stage have continued to compete because the oils have been almost perfect substitutes for each other as have the protein meals. Of course, then, when there have been surpluses of cottonseed and of soybeans, the quantities of each consumed depended upon their relative prices.

The price-support structure since 1951 has been such that even though the support level for cottonseed was lowered in 1953 and 1954, the supports on cottonseed were high enough to cause an accumulation of cottonseed products by the CCC. In contrast, soybean products moved freely into both the domestic and the foreign markets. The quantity of cottonseed has been limited by the price-support and acreage diversion program for cotton.

Under the present program, soybeans have been one of the few commercial crops for which the supply has not seemingly exceeded the demand. Farmers seem to have shifted to soybean production because of acreage restrictions for other price-supported crops and because of the high prices received for soybeans.

Future production of soybeans, then, will depend upon the price support systems in effect for soybeans, rice, cotton, and cottonseed. Soybeans have been slowly taking the market away from cottonseed, and may still be in strong demand even if the support prices between the two were equated. Restrictions on the cotton acreage will not likely terminate in the near future. Unless some restrictions are placed on the soybean acreage, soybeans will probably replace much of the restricted rice and cotton acreages.

Wheat

Wheat has never been a very stable crop in Mississippi as far as production has been concerned. It has become an

Table 2. Average prices received by Mississippi farmers for soybeans, cotton, and cottonseed, 1946-48.

Year	Soybeans		Cotton		Cottonseed	
	Price per bushel	Relative price*	Price per pound	Relative price*	Price per ton	Relative price*
1946	$3.02	122	$.284	133	$61.50	117
1947	3.35	136	.333	157	88.83	170
1948	3.20	130	.330	156	84.50	161

Source: **Agricultural Prices,** Agricultural Marketing Service, United States Department of Agriculture, Washington, D. C., February, 1943, to January, 1948.
*Index of prices received by Mississippi farmers based on 1943-45 averages = 100.

important grain crop since about 1941. The acreage has fluctuated widely since then. The five-year moving averages in Figure 4 have tended to even out these fluctuations. However, statistics for individual years indicate that the acreage has varied from 3,000 in 1951 to 45,000 in 1953.[5]

Most of the wheat in Mississippi has been produced in the Delta. Since it is a crop that prefers a cool climate, the northern part of the state has been best adapted to its production. The major part of the wheat produced in 1954 was in Tunica, Coahoma, Bolivar, Sunflower, and Washington Counties.[6] However, some wheat was produced in practically every county of the state, except in the coastal area.

Interviews with county extension and with Agricultural Stabilization and Conservation personnel during the summer of 1954 indicated that a larger acreage would be planted for winter grazing in the future. Interest in wheat for winter grazing has increased because this crop has apparently been more resistant to winter-killing than oats. Wheat for grazing has been grown primarily in the northern upland area of the state.

Whether this increased interest in wheat as a grazing crop continues will probably depend upon the way the price-support system operates in the future in regard to acreage. As long as the support program is in operation, restrictions will probably reduce the amount grown commercially that will be eligible for the loan.

Mississippi wheat yields have been favorable compared to the national averages, Table 3. This has probably been true because most of the commercially-grown wheat in Mississippi

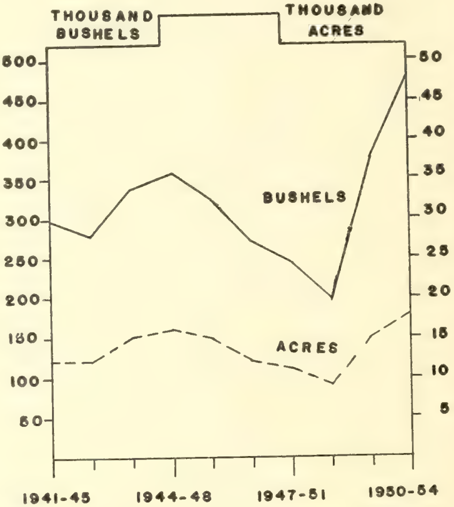

Figure 4. Five-year moving averages of wheat acreage and production in Mississippi, 1941-54.
Source: See original data in Appendix Table 6.

Table 3. United States wheat yields, and Mississippi wheat and oat yields with prices received by Mississippi farmers, 1943-52.

Year	United States wheat yields, bushels	Miss. wheat yields, bushels	Miss. wheat prices	Gross receipts per acre of wheat, Miss.	Miss. oat yields, bushels	Miss. oat prices	Gross receipts per acre of oats, Miss.	Difference between gross receipts per acre of wheat and of oats in Miss.
1943	16.6	28.0	$1.34	$37.52	30.0	$0.84	$25.20	+$12.32
1944	18.1	24.0	1.46	35.04	37.0	0.95	35.15	— 0.09
1945	17.0	21.0	1.45	30.45	31.0	0.76	23.56	+ 6.89
1946	17.2	22.0	1.85	40.70	31.0	1.08	33.48	+ 7.22
1947	18.4	23.0	2.31	53.13	30.0	1.10	33.00	+ 20.13
1948	18.0	22.0	2.20	48.40	33.0	1.04	34.32	+ 14.08
1949	14.9	22.0	1.77	38.94	30.5	0.86	26.23	+ 12.71
1950	16.5	20.0	1.96	39.20	25.0	1.00	25.00	+ 14.20
1951	16.0	25.0	2.09	52.25	29.0	1.03	29.87	+ 22.38
1952	18.3	26.0	2.15	55.90	37.0	1.05	38.85	+ 17.05
Average	17.1	23.3	$1.85	$43.15	31.4	$0.97	$30.46	+$12.69

Source: **Agricultural Statistics**, United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1945-53.

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[5] **Agricultural Statistics**, United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1952-53.

[6] Data obtained from interviewing county extension and Agricultural Stabilization and Conservation personnel during the summer of 1954.

has been produced in the more fertile Delta.

Table 3 shows some interesting facts concerning wheat and oat yields and prices in Mississippi during the ten-year period 1943-52. Wheat yields have been below those of oats; however, the price of wheat has been nearly twice that of oats. Over the ten-year period shown in the table above, Mississippi farmers in the areas where wheat and oats have grown equally well would have realized an average of $12.69 per acre more by planting wheat instead of oats. This, of course, assumed that the cost of production of the two crops would have been the same. However, it did not take into consideration the fact that the cost of the seed wheat usually would have been more than for seed oats.

There may be some question whether the oat yields in the area where wheat has been produced are the same as in Table 3, or whether they have actually been higher. Since practically all of the commercially-grown wheat has been produced in the Delta, the yield in the table should be fairly representative of the Delta. Oat yields are state averages and are probably lower than those which have been obtained in the wheat areas of Mississippi. Probably, there still has been a higher gross income per acre from wheat than from oats.

If these assumptions are valid, farmers in commercial grain production may change from oats to wheat within the limits of acreage controls. Since wheat is not very palatable as hay, it probably will not be readily substituted on livestock farms, except where the grain is to be harvested.

It would be hard to project what wheat production will be in Mississippi without restrictions and support prices on many of the crops. Its future in Mississippi as a cash grain crop probably depends almost solely on governmental action.

Rice

A use for some of the tough soils of the Delta was found when rice was introduced in Mississippi. Rice has been a comparatively new crop in the state and limited acreage and yield data are available. Rice production has been a rapidly expanding enterprise; the acreage increased from 5,000 in 1949 to 82,000 in 1954.

All of the rice in Mississippi has been produced in the Delta, except for a small acreage in Hancock County. In the past, Bolivar County has accounted for slightly more than one-half of the total production. Washington County has ranked second with more than twice that of any county below it.

High support prices without acreage restrictions in recent years in the face of a declining demand for the product, caused acreage restrictions to be imposed for the 1955 crop. Artificially guaranteed prices encouraged increased production in the United States as well as in the remainder of the world. The price has been supported at a level high enough for other countries to come into production and under-sell the United States, and at the same time has insured the domestic farmers of a stable income for an unlimited acreage.

A study by Mehren indicated that the domestic markets could handle only about one-half of the total United States production in 1954.[7] The government was forced to impose acreage restrictions because the 1954 crop was the largest in the history of rice in the United States in the face of a shrinking foreign market.

Acreage restrictions for the United States as a whole amounted to about a 25 percent reduction in the average for the past five years. A glance at Figure 5 will give some indication of what such legislation meant to Mississippi whose five-year average crop history was far below the 1954 acreage. Even by the time allowances were made for hardship cases, the 1955 acreage was only 48,499 acres, or little more than one-half of the 82,000 acres in 1954. However, if the same method of restriction is used in the future, Mississippi should be able to hold its own because the low acreages of 1950 and 1951 will be replaced by higher ones after 1955 and 1956.

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[7] Mehren, George L., **Crisis in Rice**, California Agricultural Experiment Station and Extension Leaflet No. 34, September, 1954.

As with most of the other grains, future production depends upon the price-support program. It would be hard to predict what production would be without the programs, but as long as irrigation is not too much of a problem, the high yields obtained in Mississippi will probably induce production on the tough soils of the Delta which have few, if any, alternative uses which appear as profitable.

Barley

The only official data available on barley in Mississippi ceased about 1950. Data indicate that during World War II the barley acreage reached as high as 13,000 in 1944 but by 1950 had dropped to only 1,000.[8]

Estimates by county extension and by ASC personnel during the summer of 1954 indicated that approximately 22,100 acres of barley had been planted with expectations of 1,043,000 bushels. It would seem that if such a large acreage were planted in the crop, that more data would have been available, but since no other information was available these data were accepted purely as a rough estimate. Under these circumstances, the nearest official measure of production in 1954 has consisted of the quantity which was purchased through CCC agreements and was stored for the loan. Records for a total of 99, 317 bushels were processed through the Mississippi ASC State office. In all probability, some of the barley did not come up to CCC specifications and had to be disposed of in other ways. Since no official price data were available, the possibility of part of the crop having been sold on the cash market could not be determined.

If this 22,100 acres were actually harvested, barley may begin to substitute as a cash crop in the Delta for other crops that have restricted acreages. The future of barley, like that of most of the other small grains in Mississippi, depends upon the crops which have government price supports and the methods used to carry out these programs.

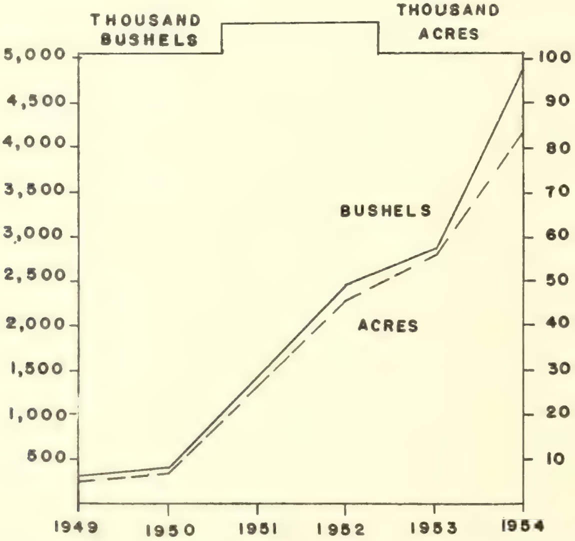

Figure 5. Rice acreage and production in Mississippi, 1949-54.
Source: See original data in Appendix Table 7.

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[8] Agricultural Statistics, United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1936-1952.

FEED GRAIN UTILIZATION

Corn, oats, barley, and wheat were considered feed grains; however, most of the grain used as feed in Mississippi consisted of corn and oats. Wheat is more generally considered a food grain but was included in this segment of the study as livestock feed because of the small amounts found in certain of the feeds.

Estimates were obtained from feed mills on in-shipments and out-shipments of grain during the previous year in order to determine how much grain was used as feed in the state. At best, these estimates were subject to possible judgment errors because many of the mills kept no records, and their businesses were very seasonal. Also a measure of the entire volume of grain processed for any particular period could not be obtaned because new feed mills were continually springing up in Mississippi.

Most of the material in this section has been based on a recent United States Department of Agriculture publication.[9] Even though the report covered the period October, 1949, through September, 1950, it was not published until June, 1954. Although the study was based only on estimates of grain movements between states, production in each state, and livestock numbers, it is probably the best obtainable at present.

Interstate Grain Movements

Mississippi has remained a deficit grain area, even with the expanded production in the past few years, and has had to ship in larger quantities, especially corn, to meet feed requirements.

Table 4 gives the sources of total supply and utilization of the different grains for the year October, 1949, to September, 1950. During this period, almost 10 percent of the corn, 16 percent of the oats, and all of the barley had to be shipped in from other areas. Since production has been variable from year to year, the value of the table is concerned more with in-shipment and total utilization.

Tabulation of the shipments of formula feed for the period covered by the table indicated that Mississippi manufactured about 300,000 tons of the 400,000 tons which were fed. The other 100,000 tons, or one-fourth of the total used, had to be shipped in from other areas.

Several large feed mills in the state have been shipping large quantities of formula feeds to other areas. Therefore, instead of just receiving the difference between the amount fed and the amount manufactured, enough had to be shipped in to replace that shipped out from the state also.

Feed Consumption by Livestock Enterprises

Table 5 shows how the feeds were allocated to the different livestock enterprises for the year October, 1949, to September, 1950. Since only 44.5 percent of the formula feed was actually

Table 4. Stocks, production and utilization of corn, oats, wheat and barley in Mississippi for the year October, 1949, through September, 1950.

Grain crops	Stocks Oct. 1, 1949	Production	In-shipments	Total on hand during year	Fed as grain	Fed as formula feed	Other uses	Total utilization	Stocks Oct. 1, 1950
					Thousand bushels				
Corn	2,857	41,995	4,785	49,637	40,460	4,785	3,321	48,566	1,071
Oats	1,938	4,312	1,000	7,250	3,125	2,312	688	6,125	1,125
Wheat	—	333	—	333	67	266	—	333	—
Barley	42	—	83	125	—	83	—	83	42
Totals	4,837	46,640	5,868	57,345	43,652	7,447	4,009	55,107	2,238

Source: Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

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[9] Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

composed of corn, oats, wheat, and barley, the table below does not give the exact proportion of grain going to each type of livestock. An analysis of the formula feed, however, indicated that the total proportion of the four grains through both sources was not greatly different from the proportions shown below.

In order to determine present feed requirements, each of the livestock enterprises was analyzed to account for changes in numbers of livestock since 1950. With the limited available data, present feed needs were computed by assuming that the amount of feed per animal for each type of livestock did not change since the time of the Jennings study. The present needs, then, have been arrived at by multiplying these rates by the numbers of livestock. The results have been weighed in the light of present production and estimates of the movement of grain in and out of Mississippi.

Dairy cattle. Dairy cattle have been consuming roughly 15 percent of the total formula feed and of the grain fed alone to livestock in Mississippi. An analysis of the formula feed showed that about 23.3 percent was grain.

Since the number of dairy cattle two years old and over has increased at about the same rate percentagewise as other dairy animals, no attempt has been made to compute the present feed requirements for each group separately. Table 6 shows the total requirements of the dairy enterprise, on the basis of the number of animals on January 1 of each year. This gives some indication of the trend in dairy animal numbers and the estimated feed requirements in order to project the future demand for dairy feed. The feeding rates are not applicable specifically to any one class of dairy animals because they are averages for the entire group.

Dairy cattle numbers have shown a substantial gain over the six-year period, indicating an increasing demand for dairy feed. As long as markets can be found for the milk, the trend will probably continue in this direction, especially with continuing acreage restrictions on several of the basic crops and with the threat of cross-compli-

Table 5. Utilization of feed by livestock enterprises in Mississippi for the year October, 1949, through September, 1950.

Livestock enterprise	Formula feed utilized	Grain alone utilized	Total feed utilized	Percent of total utilization
		Thousand tons		
Dairy cattle	95	153	248	15.5
Beef cattle	—	14	14	0.9
Sheep	—	1	1	0.1
Hogs	18	424	422	27.8
Poultry	242	232	474	29.8
Horses and mules	35	343	378	23.7
Others	17	18	35	2.2
Total	407	1,185	1,592	100.0

Source: Jennings, R. D., **Feed Consumed by Livestock, supply and Disposition of Feeds, 1949-50**, United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

Table 6. Consumption of formula feed and grain by Mississippi dairy animals on an annual basis, 1950-55.

Year	No. of animals as of Jan. 1	Formula feeds		Corn		Oats		Total
		Per head,* tons	Con-sumed, tons	Per head,* bushels	Con-sumed, bushels	Per head,* bushels	Con-sumed, bushels	consump-tion, tons**
	(000)		(000)		(000)		(000)	(000)
1955	952	.1165	111	6.57	6,255	.23	219	321
1954	934	.1165	109	6.57	6,136	.23	215	315
1953	900	.1165	105	6.57	5,928	.23	207	274
1952	855	.1165	100	6.57	5,606	.23	197	260
1951	816	.1165	95	6.57	5,363	.23	188	248
1950	815	.1165	95	6.57	5,356	.23	187	248

Source: **Livestock and Poultry on Farm and Ranch, January 1**, United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., 1951-55; and Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feed, 1949-50**, United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

*A constant feeding rate per head was assumed throughout the period.

**Corn and oats have been converted to tons.

ance acreage restrictions for all of the supported crops.

Mississippi's average milk production per cow has been only slightly above one-half of that for the nation as a whole. Part of this low production can probably be attributed to the quality of dairy animals found in Mississippi. Also responsible is the fact that, on the average, Mississippi milk cows have been receiving only about 65 percent as much concentrates per cow as the national average. This leaves a great deal of improvement possible as far as feeding is concerned, and would require a large volume of concentrates to come up even close to the national average.

Beef cattle. Beef cattle, as used here, include all cattle other than those reported as kept for milk. Dairy-type steers and bulls would be included in beef cattle. In 1950, about 80 percent of these animals was classified strictly as beef. Since most of these received about the same kind of concentrates, they were all dealt with as one group. The feeding rates were averages for the group regardless of type or age, and should not be thought of as the rate for any particular kind of beef cattle.

Little, if any, formula feed has been used in normal commercial beef cattle operations in Mississippi. What little may have been fed would have gone to show cattle and maybe to purebred animals on a very limited scale. Only about 1 percent of the total formula feed and grain fed alone was consumed by beef cattle in Mississippi in the year October, 1949, to September, 1950.

Corn has been the only grain of any significance fed to beef animals. Most of the feed consumed by this class of livestock has been in the form of cottonseed and cottonseed meal along with hay. Winter grazing has helped to reduce the requirements for other feeds during the winter months. Since Mississippi has been primarily an area of grass-fattened cattle, about the only time concentrates have been fed was during the periods when little grass was available.

Table 7. Consumption of corn by beef cattle in Mississippi on an annual basis, 1950-55.

Year	Number of animals as of Jan. 1	Consumption per head,* bushels	Total corn consumption, bushels
	(000)		(000)
1955	1,128	.5820	656
1954	1,105	.5820	643
1953	988	.5820	575
1952	813	.5820	473
1951	760	.5820	442
1950	859	.5820	500

Source: **Livestock and Poultry on Farm and Ranch, January 1,** United States Depart- of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington D C., 1951-55; and Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

*A constant feeding rate per head was assumed throughout the period.

Table 7 indicates that, on the average, beef cattle in Mississippi have consumed only a very small amount of corn. Only slightly over one-half bushel per animal was fed in 1950 when prices for all grades of beef cattle were relatively good. This rate may have decreased when cattle prices fell in the spring of 1952 in order to reduce the cost of production. However, since most of the decrease in prices has been for the lower grades of animals, farmers may have put more emphasis on grain feeding to get more animals in the higher grades, which have fallen in price much less proportionally.

If the cross-compliance restrictions are imposed on the crops whose prices are supported by the government and the diverted acreage must be converted to conservation practices, as has been proposed, livestock enterprises which consume large quantities of grass are one of the few alternatives. The market has been such that dairy products are already hard to sell in Mississippi because of present supplies. Even with depressed beef prices for the lower grades, beef cattle would be one of the more feasible livstock enterprises.

Since the higher grades of beef will probably continue to bring a price well above that for the lower ones, the logical operation would be to breed and to feed the animals as economically as possible to get them into the higher grades. The trend should be in this direction regardless of whether it is brought about through governmental action on the supported crops or by farmers simply attempting to maximize their income from beef cattle. Even if cross-compliance restrictions are imposed, provisions will probably be made for the production of grain eligible only for farm consumption.

It is generally agreed that grass-finished steers and heifers seldom grade "prime," and only the extreme top quality ones ever reach "choice." This means that most of the better grass-finished cattle usually fall in "good" and "commercial" grades. However, if cattle of comparable breeding and conformation are given a short-term grain finishing, they can expect to be upgraded to "choice" and "good".[10]

Interviews with county extension personnel and elevator and feed mill operators during the summer of 1954 indicated an increasing interest in feeding out beef animals in Missssippi. If Corn Belt farmers have been able to purchase feeder calves and make a profit on feeding them out, it would seem that Mississippi farmers should be able to produce calves on grass until shortly before marketing and then put them in the feed lot on concentrates at a profit. This would in effect market grain for farmers through higher grades of cattle which sell for more favorable prices. However, part of the benefits from producing quality beef would be offset unless farmers market their cattle through outlets which recognize and pay premiums for high quality animals. Taking into consideration the already-surplus supply of oats and possibility of increasng corn yields, Mississippi should be able to initiate such a program on a limited scale.

Sheep. The sheep industry in Mississippi has been somewhat like that of the beef cattle. Both have increased in numbers at about the same percentage rate over the six-year period. Sheep, too, have been mostly grass fed and have consumed very little concentrates because the sheep enterprise in the South has been one of producing grass-fattend slaughter lambs.

Of the total concentrates consumed, sheep received less than 0.1 percent in Mississippi during the year October, 1949, to September, 1950. As in the beef cattle enterprise, this has been composed mostly of corn with little or no formula feed. Table 8 gives some indication of the trend in sheep numbers in Mississippi as well as their feed requirements.

Table 8. Consumption of corn by sheep in Mississippi on an annual basis, 1950-55.

Year	Number of animals as of Jan. 1	Consumption per head,* bushels	Total corn consumption, bushels
	(000)		(000)
1955	91	.5454	50
1954	91	.5454	50
1953	83	.5454	45
1952	77	.5454	42
1951	73	.5454	40
1950	66	.5454	36

Source: **Livestock and Poultry on Farm and Ranch, January 1**, United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., 1951-55; and Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50**, United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

*A constant feeding rate per head was assumed throughout the period.

Sheep numbers will probably continue to increase in Mississippi as better management practices are worked out, but will depend upon future prices for feed and slaughter lambs. The more important management problems have been losses due to dogs and other animals, and failures to give adequate care during the winter and lambing season and to cull old ewes.[11]

Sheep will probably never account for great quantities of grain consumption in Mississippi regardless of numbers, as long as grazing can be provided practically all year. Even if some lambs were grain-fattened in Mississippi, the amount of grain used would be insignificant in terms of the total because of the small quantities required.

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[10] Johnson, Jack D., **Livestock Marketing in the Southern Region**, Southern Cooperative Bulletin 26, July, 1952, pp. 66-68.

[11] Parvin, D. W., **An Economic Appraisal of Sheep Production in the Northeast Prairie of Mississippi**, Mississippi Agricultural Experiment Station Bulletin 495, December, 1952, p. 12.

Hogs. Hog numbers showed an almost steady decline through the first five years of the period covered by Table 9. However, the upturn in 1955 may be an indication that the trend is going to reverse itself. During the year of Jennings' study, hogs and pigs ranked second as far as total consumption of formula feed and of grains was concerned, Table 5. About 28 percent, composed mostly of corn, went to this group during the year October, 1949, to September, 1950.

Table 9 gives some indication of how total grain and formula feed requirements have declined during the six-year period, assuming feeding rates have not changed to any great extent. Any change that may have occurred in the feeding rates would be hard to detect for several reasons. First, this period was in the midst of the trend to convert from the large lard hog to the smaller meat type. Second, relatively good prices toward the latter part of the period may have influenced farmers to do a better feeding job. Third, since some hogs and corn have been produced on almost every farm, the reduction in numbers may have caused farmers to feed each animal more; however, corn production has been low since 1950 because of drought.

At present, the trend in hog numbers is hard to project. If the expectations for a large pig crop in 1955 materialize, the downward trend in numbers indicated by the above table will probably be checked. Trends will depend upon the prices for hogs and for other meat animals. Diseases have probably had quite a bit of influence on hog numbers in the past and may continue to depress the quantity produced in the future in Mississippi. Year-to-year production will be dependent to a large extent upon the price of corn and of other concentrates.

Horses and mules. Horses and mules have been decreasing slowly in numbers at about the rate of 25,000 head a year. The decline will continue as modern machinery replaces them as workstock. As Table 5 indicated, this group has been a large consumer of grain. Table 10 gives a more thorough breakdown to show how the grain consumed by workstock has been divided between corn and oats. An analysis of the formula feed showed that it has been composed of more than a third corn and oats divided about equally between the two.

The rate and extent of decline in numbers is rather difficult to project. The rate will probably depend to a large extent on economic conditions, available labor, and trends in sizes of farms. The number of animals will probably never become completely static, but will undoubtedly decrease at a much slower rate than at present. The relatively constant number remaining will depend upon the requirements for purposes other than workstock and the number of small hill farms on which the use of modern equipment is not feasible.

Poultry. Determining feed consumed by poultry was complicated because of the different divisions of the enterprise. The approach used was to di-

Table 9. Consumption of formula feed and grain by hogs in Mississippi on an annual basis, 1950-55.

Year	No. of animals as of Jan. 1	Formula feeds		Corn		Oats		Total consumption, tons**
		Per head,* tons	Consumed, tons	Per head,* bushels	Consumed, bushels	Per head,* bushels	Consumed, bushels	
	(000)		(000)		(000)		(000)	(000)
1955	631	.0186	12	15.615	9,853	.129	81	289
1954	590	.0186	11	15.615	9,213	.129	76	270
1953	756	.0186	14	15,615	11,805	.129	98	347
1952	889	.0186	17	15.615	13,882	.129	115	408
1951	946	.0186	18	15.615	14,771	.129	123	434
1950	965	.0186	18	15.615	15,069	.129	125	442

Source: **Livestock and Poultry on Farm and Ranch, January 1,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., 1951-55; and Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

*A constant feeding rate per head was assumed throughout the period.

**Corn and oats have been converted to tons.

vide this group into turkeys and chickens with a sub-division of chickens into broilers, laying flock, and chickens raised other than in commercial broiler and laying flock production. Instead of using inventories of numbers as of January 1 each year as for other livestock, averages and totals for the year have been used.

In 1950, poultry was the largest consumer of formula feed and of grain fed, receiving alone about 30 percent of the total utilization for all livestock. About half of the feed going to this group was fed as grain composed mostly of corn. However, it was through this group that any appreciable amounts of wheat and of barley were consumed, Table 4. An analysis of the formula feed used by poultry indicated that nearly 40 percent was corn.

Broiler production is the latest addition to Mississippi livestock enterprises. As shown in Table 11, broiler numbers increased from 17,000,000 in 1950 to 40,300,000 in 1954.

This enterprise has required almost 100 percent formula feed, part of which has been manufactured in Mississippi. A large part of that manufactured in the state has been by local mills which have purchased concentrates from major feed manufacturers and have added the shelled corn. In the past, most of this corn was shipped in from other areas because a year-round supply was not available. There are few commercial corn shellers in the state to shell the corn which has been produced.

Another factor which has prevented locally-grown corn from being processed into broiler feed has been its color. Because of differences in the nutritive content, yellow corn has been preferred over white corn for this purpose. In some areas in Mississippi custom has caused farmers to produce only white corn. These factors have made it necessary for most of the corn used for formula feed for poultry to be shipped in from other areas. One of Mississippi's greatest potential grain markets has been for yellow, shelled corn available on an annual basis as the poultry enterprise needs it.

Table 10. Consumption of formula feed and grain by horses and mules in Mississippi on an annual basis, 1950-55.

Year	No. of animals as of Jan. 1	Formula feeds		Corn		Oats		Total consumption, tons**
		Per head,* tons	Consumed, tons	Per head,* bushels	Consumed, bushels	Per head,* bushels	Consumed, bushels	
	(000)		(000)		(000)		(000)	(000)
1955	266	.0921	24	29.88	7,948	4.11	1,093	264
1954	292	.0921	27	29.88	8,725	4.11	1,200	290
1953	319	.0921	29	29.88	9,532	4.11	1,311	317
1952	339	.0921	31	29.88	10,129	4.11	1,393	337
1951	368	.0921	34	29.88	10,996	4.11	1,512	366
1950	380	.0921	35	29.88	11,356	4.11	1,563	378

Source: **Livestock and Poultry on Farm and Ranch, January 1,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., 1951-55; and Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feeds, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954.

*A constant feeding rate per head has been assumed throughout the period.

**Oats and corn have been converted to tons.

Table 11. Consumption of formula feed by broilers in Mississippi on an annual basis, 1950-54.

Year	Number produced during year, million	Feed per head,* pounds	Total consumption, tons	Portion of feed which is corn, bushels
				(000)
1954	40.3	9.2	185	2,642
1953	35.1	9.2	161	2,300
1952	30.8	9.2	142	2,028
1951	23.5	9.2	108	1,543
1950	17.0	9.2	78	1,111

Source: Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feed, 1949-50,** United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, June, 1954; **Poultry and Egg Situation,** United States Department of Agriculture, Agricultural Marketing Service, Washington, D. C., October, 1954, and May, 1955; and **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1951-53.

*A constant feeding rate per head has been assumed throughout the period.

The outlook is for the broiler enterprise, even with depressed prices, to continue at the 1954 level or even increase. Since the facilities have practically no alternative use, producers will probably continue as long as they can cover variable costs.

The group of chickens classified as "other chickens raised" is to a certain extent the replacements for the pullets and laying hens. This "other" group also includes "back-yard flocks" — broilers for home use and the small laying flock found on practically every farm.

The pullets and laying flocks consumed nearly 60 percent of the total feed going to poultry in the year October, 1949, to September, 1950. Their numbers have remained almost stable at about five to seven million head, with only slight fluctuations during the period. Present feed requirements probably have not varied far from the 272,000 tons in 1950.

Until a more adequate marketing system for handling eggs is established in Mississippi, production of laying hens will probably continue to fluctuate between five and seven million head. The decrease in the price of eggs during the latter part of 1954 and early in 1955 may have caused some of the laying flocks to be sold. Decreased inventories during this period may cause enough decrease in the egg supply to bring about a rise in egg prices during the latter part of 1955.

The "other" group of chickens mentioned above has remained fairly constant at about 11 to 12 million head. Present feed requirements by this group probably does not vary far from the 120,000 tons of concentrates consumed in the year October, 1949, to September, 1950.

Turkeys have been of minor importance in Mississippi as far as feed consumption has been concerned. In 1950 turkeys consumed less than 1 percent of the concentrates fed to all groups of poultry. Turkey numbers will vary from year to year but feed consumed will be minor unless a drastic increase in numbers is made.

Other livestock. The group classified as other livestock in Table 5 included all livestock and poultry in cities and other than those reported on farms. No reliable estimates of numbers have been made available.

Some of the types of livestock on farms for which no estimates have been available are ducks, geese, guineas, rabbits, dogs, cats, and goats. Livestock in cities included milk cows, horses, chickens, hogs, and goats.

Since no annual estimates of numbers have been made, one way to arrive at present feed requirements was to assume that, if any changes have occurred since 1950, increases and decreases have offset each other so that the total needs have remained approximately the same.

Trends in the Utilization of the Feed Grains

Changes in livestock numbers resulted in a net decrease in corn consumption in 1954 as compared to 1950 (Appendix Table 8). Poultry, and dairy and beef cattle consumption rose while the needs for hogs, horses, and mules declined. Projections into the near future would likely find the same situation except that feed requirements for hogs may begin to rise to provide for increases in their numbers.

Oats fed increased slightly in 1954, if those in formula feeds were considered. This was due primarily to increases in the volume of formula feed for poultry which contained a relatively high percentage of oats.

Since most of the wheat consumed by livestock in Mississippi was in formula feed for poultry, wheat would have increased from about 333,000 bushels in 1950 to 467,000 in 1954. Practically all of the barley also would have been used in this same way. Barley, then, would have increased from 83,000 bushels to 126,000 during this period.

Total formula feed requirements increased about 26 percent. Most of this increase, of course, went to poultry. There was no way to determine exactly how much of this formula feed was manufactured in Mississippi, but with the increased number of feed mills it may be expected that at least as high a proportion was manufactured in Mississippi in 1954 as in 1950.

Even though corn needs had decreased nearly six million bushels from 1950 to 1954, there was a deficit of over 20 percent in 1954 (Appendix Table 8). Actually more than that amount had to be shipped in because corn was shipped from the state in formula feeds which made the deficit even greater. A large part of this corn received from other areas was shelled, yellow corn for the poultry enterprises and that in formula feeds of the types which were not manufactured in Mississippi.

Oats, wheat, and barley production were high enough in 1954 to meet Mississippi's feed requirements. However, the local grain supply in some areas was insufficient to meet needs because large quantities of the grains went into the government loan creating local shortages.

SEASONAL PRICE VARIATIONS AND STORAGE CHARGES AND COSTS

This section presents a measure of the income, or possible loss, which may be expected from storing grain crops at estimated storage costs and points out its relationship to seasonal price movements. Estimates of income from grain storage are hard to derive, and results may be misleading because seasonal grain prices are usually based on violently fluctuating monthly prices.

Seasonal Grain Prices in Mississippi

Mississippi farmers have not been receiving the full market value for their grain crops. There has been a tendency for them to sell their grain at harvest when the market has been glutted. An analysis of prices received by farmers over a period of years indicated that a delay of several months in selling their grains has usually paid them well.

Prices of corn, oats, soybeans, and wheat received by Mississippi farmers for the post World War II period 1947-54, have been converted to a seasonal price index using a 13-month moving average to remove the trend. Price data for rice covered only the past four years. Since annual seasonal price trends for rice were not very distinct during this short period, no attempt was made to determine the trend in seasonal price variations. No price data for barley in Mississippi were available after November, 1951.

Figure 6 presents seasonal price indexes for the period 1947-54, which indicate the extent of the fluctuations in the seasonal prices. Since the prices have been expressed as percentages, the data do not give the range of fluctuations in absolute amounts. However, absolute prices by months, based on the average for the past eight years, can be computed by multiplying the average annual price for any year, or any group of years, by the percentages in Figure 6, or Appendix Table 9. Seasonal prices derived by the above method simply indicated what has occurred on the average during the eight-year period; however, the actual prices during any particular period included in the graph may have been contrary to the general pattern.

Since seasonal prices have continually shifted from time to time, they must be handled cautiously in order to determine the trend in the amount of the fluctuations and the consistency of prices to follow the same pattern from year to year.

Past seasonal price behavior for the various grains. A brief description and explanation of the price pattern for each grain is necessary, because of the trend in the range of the fluctuations and the consistency of the prices to follow any set pattern have varied from one crop to another. The range of fluctuation has been widest for soybeans and least pronounced for wheat.

Soybeans. Soybean prices over the eight-year period were at the maximum in May and at the minimum in October. A year-by-year analysis of the actual prices indicated that in six out of the eight years the maximum actually occurred in May, but only in three years did the lowest price come in October. The range of fluctuations from the lowest price of one fall to the highest of the next spring disregarding trend, varied from $.20 to $1.15 per bushel. In all instances, the crop was worth more the following spring than at harvest.

Mere observation indicated no significant trend in the amount of variation; however, some evidence existed that farmers were awakening to the wide soybean price spread.[12] Soybean prices for the spring of 1955 were above those at harvest in 1954, but from indications through May, 1955, the seasonal high occurred in February. The average United States price, however, was lower in May than during the normal seasonal low of October. Therefore, as soon as storage facilities become available, farmers in Mississippi may find the range of price variations for soybeans reduced.

Oats. Oats had a peculiar seasonal price pattern over the period of study. Instead of having one high and one low price, the crop reached a maximum of 106.5 percent in November, fell through February to 101.1 percent, and rose again to 104.7 percent in April. The low occurred in July at 89.2 percent. An analysis of the original data showed that during the eight years studied, prices reached their first peak in the above pattern three times in November, once in April, and reached their lowest level four times in July.

The price for oats was higher in the fall than during harvest in the summer, except for one year. The amount of variation ranged from 17 to 35 cents per bushel during the years when the price in the fall was higher than that of the previous summer. The second price peak in April has not been as distinct as the one in November. If no correction is made for trend in the original data, the differential from the low at harvest to the high in the fall has averaged about 18 cents per bushel. The average range between the high and low has been somewhat reduced by prices during the one year, which did not follow the normal seasonal price pattern.

The double peak in oat prices may have been caused by the nature of the competition between oats and corn. The arrival of corn upon the market immediately after the peak price for oats may have driven oat prices down. Later in the spring the demand for oats as workstock feed may have bid oat prices back up.

Corn. Of the grains under study, corn ranked third in percentage fluctuations of prices. Over the eight-year period, the highest prices have usually occurred in July and the lowest in November. The high price actually was reached in July twice, and the low occurred four times in November. In every year during the period, corn was worth more in the following summer than it was the previous fall.

The range of the price differentials for corn has varied rom 5 to 60 cents per bushel. The average, however, has been 27 cents per bushel. No significant trend appears to have developed in the amount of price spread for corn.

Wheat. Of the four grains whose prices were analyzed, wheat has shown the least amount of percentage fluctuation. The large stocks of wheat held by the CCC may have accounted for this behavior. When wheat prices were adjusted for trend, the highest index of price was reported in January and the lowest in August. Neither extreme in the actual prices received was very distinct. However, an average of the actual prices indicated a differential of 23 cents per bushel during the eight-year period.

Observation of the absolute prices revealed no significant trend in the tendency of the range of the price fluctuations. During the period 1947-54, wheat was worth more either in the late fall or the following spring than it was at harvest.

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[12] For instance, some comments on soybean stocks in **Crop Production**, Agricultural Marketing Service, Crop Reporting Board, United States Department of Agriculture, Washington, D. C., April 1, 1955, p. 7.

Seasonal trends in grain prices. To summarize briefly, distinct seasonal price fluctuations existed during the period 1947-54 in the price of soybeans, oats, corn, and wheat. Mere observation showed no significant indication of changes in the amount or pattern of seasonal price variations.

Some evidence in the early part of 1955 has indicated that farmers may have become aware of the price differentials for soybeans. As farmers discover the wide ranges of seasonal prices for some of the crops and begin to take advantage of these spreads by storing, the seasonal differentials should approach a range that reflects storage costs, plus the risk of carrying the grain to a later time.

Grain Storage Charges and Costs

No detailed study of storage costs for the individual grains was undertaken in this study. However, several such stu-

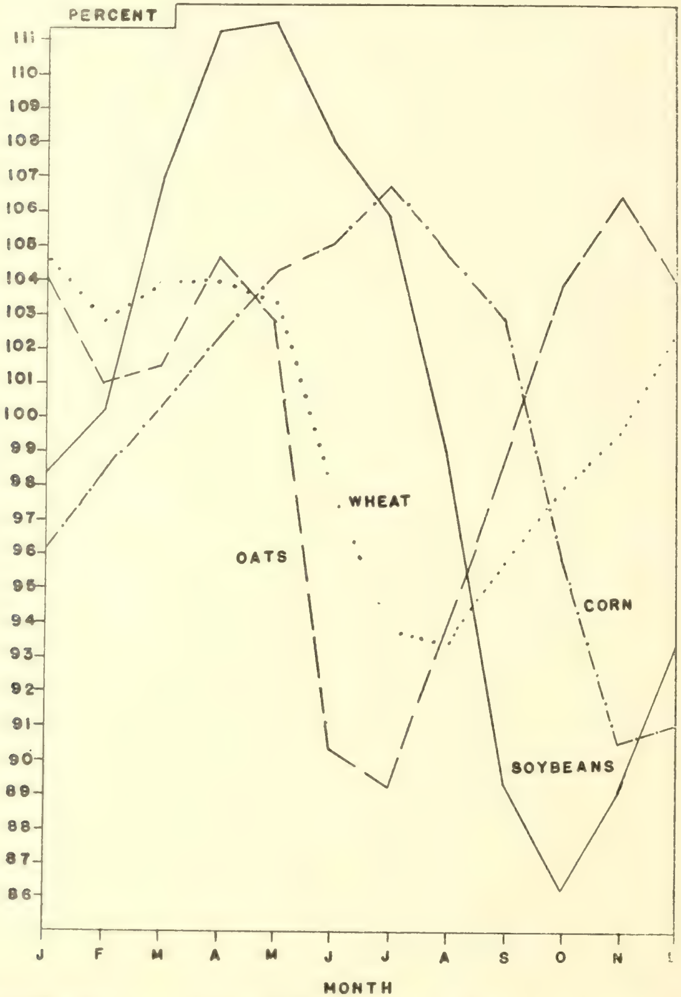

Figure 6. Seasonal index of monthly prices received by Mississippi farmers for corn, oats, wheat, and soybeans, 1947-54.
Source: See original data in Appendix Table 9.

dies have been made fairly recently in some of the other Southern states.[13] Costs have been mentioned briefly in order to present an estimate of what farmers can expect if they store their grain and take advantage of the seasonal price variations.

Estimates of storage costs presented in this study are not in all instances complete and in some cases only hypothetical. However, these limitations have been pointed out, and methods of determining the exact cost in specific cases mentioned. Since costs have varied from one season to the next, the data presented in this section should be of more value as a guide than as specific amounts.

This section presents costs for different methods of storing, which includes steel bins on the farm, other types of farm storage, commercial elevators, and commercial bins.

Costs of storing grain in steel bins. The fixed costs for storage in steel bins can be fairly accurately computed because installation costs for most types of bins have been almost uniform. However, no farm data have been obtained in Mississippi on the variable costs for grain storage for farm structures. Some of the studies mentioned above have presented these costs. However, these data may not be readily adaptable to Mississippi conditions.

Table 12 was developed as a hypothetical example to give some indication of the cost of erecting a 1,000-bushel steel bin. Most bins of this size cost about $400 installed. The expected life of the bin should be 25 to 30 years with few, if any, repairs.

The estimated annual cost of such a bin was $29 based on an interest rate of 4 percent. This rate of interest was selected because government loans amounting to 80 percent of the cost of the storage structure can be obtained at 4 percent interest. The insurance and tax rates are the same as those used in the North Carolina study.

The major determinant of the fixed costs per bushel has been the capacity to which the structure has been used. As indicated in the Table below, the fixed cost per bushel of storing 250 bushels of grain in a 1,000-bushel bin has been four times the cost of using the bin to capacity.

The difficulty of completing an estimate of the cost of storage in metal bins has been the lack of data on the variable costs. The most important of these have been labor, shrinkage, quality deterioration, insect and rodent control, and loan and interest charges where government loans have been obtained. Quality does not in all cases deteriorate, and in some instances, it may actually improve. Under such circumstances, the change of quality would be an income rather than a cost.

Some of these costs have been constant from one state to another. The loan and interest charges can be computed from a table of rates. The loan or service charge for all grains stored on farms, except rice, has amounted to

Table 12. Estimated annual fixed costs for a 1,000-bushel steel bin.*

Cost	Annual cost	Cost per bushel			
		1,000 bushels	750 bushels	500 bushels	250 bushels
	Dollars	Cents per bushel			
Depreciation @ 4%	16	1.60	2.40	3.20	6.40
Interest @ 4%	8**	.80	1.20	1.60	3.20
Insurance	3	.30	.45	.60	1.20
Taxes	2	.20	.30	.40	.80
Total	29	2.90	4.35	5.80	11.60

Source: Devised from a similar estimate by W. D. Toussaint and John M. Curtis, **Grain Storage in North Carolina—Does It Pay?**, Department of Agricultural Economics, Agricultural Economic series No. 33, North Carolina State College, June, 1954, p. 33-34.

*Based on an original cost of $400 for the bin.

**Based on $200 or the average principal instead of the entire $400 as was done in the North Carolina study.

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[13] Toussaint, W. D., and Curtis, John M., **Grain Storage in North Carolina—Does It Pay?**, Department of Agricultural Economics, Agricultural Economics series No. 33, North Carolina State College, June, 1954: and Efferson, J. Norman, et. al., **An Economic Study of Rough Rice Storage in the Southern States**, United States Department of Agriculture, Agricultural Marketing Service, Marketing Research Report No. 75, November, 1954.

1 cent per bushel with a minimum charge of $3.00. For rice these rates have been $5.00 for each lot sampled and 2 cents per hundred pounds with a minimum of $3.00. The interest rate on all grain loans has been 3.5 percent per annum from the date of disbursement of the loan.

Labor cost for filling the bins should not have varied far from those for disposing of the grain directly at harvest. Emptying of the bins in most instances usually comes at a slack period as far as the labor force has been concerned. Costs of these two operations, therefore, should not have been of any great significance. However, computation of the cost of turning the grain in the event it were stored with too high a moisture content involves some difficulties.

Rodent control can be eliminated by the use of steel bins. Insect control, however, has created another problem as far as the computation of costs has been concerned. No farm data have been made available on this subject in Mississippi. If data were available, it would contain only estimates for a selected sample of bins and would not be of any great value because insect infestations vary from season to season and from one grain to another.

As was the case with insect control, no farm data have been obtained on shrinkage and quality deterioration for Mississippi. Both shrinkage and quality deterioration have been largely dependent upon the moisture content of the grain when it was placed in the bins. These factors also have varied with the seasons and kinds of grain.

While a reliable estimate of average variable storage costs could not be made from data available in this study, consideration of variable factors pointed out above should aid producers in reaching storage decisions.

Costs of farm storage in other structures. Storage on the farm in structures other than in steel bins has made the computation of cost almost impossible because of the many varied types of facilities. Each type of facility has involved different costs.

The cost of storing in most steel structures can be computed somewhat like that for steel bins. Facilities constructed of less durable materials, such as wood, have involved additional costs for repairs. Some farm bins have not been rodent proof and have required additional costs for rat and mice control.

Even though several of the other costs have changed from those for steel bins, most farmers should be able to compute at least their fixed storage cost and part of the variable ones.

Commercial elevator storage rates. All of the commercial elevators under storage agreements with the CCC reported charging the maximum storage rates as established by the CCC. Therefore, the rates presented in this section were obtained from the CCC schedule of rates for varying intervals of time. Usually the elevators have used these rates regardless of whether the grains were stored for the loan or for some other purpose. Except for grain stored in some of the cooperatively-owned elevators, a large part of that stored in the commercial elevators under storage agreements in Mississippi has been for government loans.

Table 13 shows the CCC schedule of rates for the different grains for varying intervals of time. Determination of charges simply involves the addition of the handling charges to the storage rates for the desired length of

Table 13. Maximum commercial handling and storage rates in Mississippi as allowed by CCC for selected grains for varying intervals of time.

Crop	Handling charges: Receiving	Handling charges: Loading out	Storage charges: 3 months 91 days	Storage charges: 6 months 183 days	Storage charges: 9 months 274 days	Storage charges: 12 months 365 days
			Cents per bushel			
Oats	3.0	0.5	3.0	6.1	8.8	11.2
Corn	4.0	0.5	4.6	9.2	12.6	15.7
Barley	5.0	0.5	4.6	9.2	12.6	15.7
Wheat, soybeans, and rice	7.5	0.5	4.6	9.2	13.5	16.5

Source: 1954 Commodity Credit Corporation "Schedule of Rates," CCC Form 25-1, March 31, 1954.

storage. Payment of these rates, provided they are the ones used by the elevator, relieves the farmer of all responsibility of caring for his grain until it has been sold or returned to his farm. This responsibility for the grain has gone so far as to include shrinkage and quality deterioration. Grain placed in the loan involves a more complicated procedure for cost determination.

When grain is stored for a loan, the same service and interest charges are paid as outlined previously under cost of storage in steel bins. Also the farmer pays for the storage charges before and during the time he has a loan on the grain. If the farmer allowed the CCC to take possession of the grain, he does not pay the handling charges. In the event the farmer has paid the handling charges before obtaining the government loan, a refund is given to him. However, if a farmer chooses to redeem his grain, he has to pay all the above charges These include service, interest, handling, and storage.

Commercial bin storage rates. In 1954, there were two groups of commercial bins in operation in Mississippi. The larger of these operations was a privately-owned business located at Greenwood. The storage facilities, which were farmer owned, consisted of 86 bins with capacities of 2,200 bushels each.

The other bins, located at Booneville, were cooperatively owned. This storage operation has been performed with 19 bins having a capacity of 1,000 bushels each.

Since each business was operated differently, they are discussed separately here. Under both arrangements farmers obtained government loans in the same manner as for on-the-farm facilities. Also in both cases, the farmers were relieved of most of the responsibility for the condition of the grain.

Farmers were charged $25 per year as rent for the lot on which their bins were located at Greenwood. Then as handling charges, they paid 5 cents per bushel for oats and 10 cents per bushel for all other grains. Table 14 presents a clearer picture of this operation.

Computation of the cost of storing a particular grain involves only the addition of the handling charge to the storage charge, as made up by the rent of the lot, plus the fixed cost of the bin. No fixed cost data were available for the 2,200 bushel bins, but the cost per bushel should have been near if not below that found in Table 12.

Instead of owning the bins and paying both rent and handling charges as at Greenwood, the farmers at Booneville pay a fee of $90 for the use of the bins. These bins were erected chiefly to assemble soybeans for the market. The cooperative has assumed responsibility for soybeans if the moisture content has been 14 percent or lower.

The charge for storing 1,000, 750, 500, and 250 bushels of grain has been 9, 12, 18, and 36 cents per bushel, respectively. With such an arrangement, farmers have hardly been able to afford storage of much less than the bins' capacities.

The rent has been set at $90 per year in order to pay for the bins in four years. Farmers in the area have been encouraged to purchase their own bins and to locate them on the area owned by the cooperative. The goal of this program has been to assemble large quantities of soybeans convenient to loading-out facilities and to the supervision of the Booneville farmer-cooperative manager.

In the case of both groups of bins, the management of the bins assumed responsibility for losses other than shrinkage and normal quality deterioration of the grain. Normal quality deterioration, in this instance, refers to change in quality through no fault

Table 14. Handling and rent charges for storing various quantities of grain at Greenwood, Mississippi, in 2,200-bushel commercial grain bins.

Crop	Handling charges	Annual rent of lot	Rental charge per bushel			
			2,200 bushels	1,650 bushels	1,100 bushels	550 bushels
	cents per bu.	dollars	cents per bushel			
Oats	5	25	1.14	1.52	2.27	4.54
Other grains	10	25	1.14	1.52	2.27	4.54

of the management of the storage facilities.

The above charges for storage in commercial bins probably have not been far from those for storing grains in commercial elevators and in steel bins on the farm. Lack of a measure for the value of the several services and of variable costs has prevented a more thorough comparison of the costs of storing in the different types of facilities.

Theoretical Storage Income

An attempt to determine possible gains from storing grain by relating past seasonal price fluctuations with storage costs is of little value as evidence of an exact income in the future for any specific period of time. However, a study of these relationships should serve as an indication of what might be expected. At least a brief summary of the relationship between seasonal prices and storage costs is necessary to point out to farmers some of the possible opportunities of holding their grain for a few months in order to obtain a more favorable price.

During the period 1947-54 the seasonal price spread per bushel averaged 76 cents for soybeans, 18 cents for oats, 27 cents for corn, and 23 cents for wheat. Commercial storage and handling charges for nine months, based on 1954 rates, were 22 cents for soybeans, 12 cents for oats, 17 cents for corn, and 22 cents for wheat. Nine months of storage has usually been sufficient for all of the grains to reach their seasonal peak in prices if storage began at harvest. The differences between the average price spread and the commercial storage rates for 1954 were 54 cents for soybeans, 6 cents for oats, 10 cents for corn, and 1 cent for wheat.

Differences between charges for storage in commercial bins at Booneville, (assuming storage at 100 percent of capacity) and seasonal price spreads were 67 cents per bushel for soybeans, 9 cents for oats, 18 cents for corn, and 14 cents for wheat. It should be borne in mind that storage charges in this case were compiled for an entire year, rather than on a nine-month basis as was done for commercial storage, since the bins were rented on an annual basis.

The two comparisons above were used because data on storage cost were more nearly complete for these types of facilities. A further warning is necessary to remind farmers not to take the above differences between storage charges and seasonal price spreads as an established margin of net income, but to handle these data as a reflection of what has occurred in the past and as a guide in determining future income expectations. Seasonal price spreads depend upon supply and demand factors and may or may not follow a seemingly established pattern of the past.

STORAGE FACILITIES

A numerical measure alone of the capacity of grain storage facilities in Mississippi would not describe the storage situation without an explanation of the adequacy of such facilities. Therefore, the storage facility situation has been described rather than stated as so many bushels of capacity. A description of the storage operation points out in itself why a numerical measure of the capacity of the facilities is little more than one of many clues to the adequacy.

Types of Facilities

Grain storage facilities in Mississippi have been broken into two broad groups for the purpose of this study. The basis for this division has been the classification given government grain loans under the price support programs. The two major categories have been commercial elevators and on-the-farm facilities. Under this system of classification, on-the-farm facilities have not necessarily been located on farms but may have been elevators or bins centrally located at loading-out sites. The groups of commercial storage bins at Greenwood and Booneville have both been included in this category. Even though these bins were not located on the farms of the producers who used them, loans for the grain placed in the bins have been processed as if the farmers were performing the storage operation.

Commercial elevators. Commercial elevators have been divided into those under storage agreements with the CCC and those not under agreements. Grain storage agreements are contracts between elevators and the CCC. The elevators agree to accept and store grains, associated with the price support program, up to the capacity stated in the agreement. The management assumes all responsibility for the grain, including shrinkage and quality deterioration.

Practically all of the larger elevators in the state were under storage agreements in 1954. However, the elevators at Natchez and Vicksburg have been acting in the capacity of terminal and sub-terminal warehouses. Instead of providing commercial storage facilities for farmers, these elevators have been more interested in buying and selling operations. Some elevators are corporations owned by farmers who have preferred not to enter into contracts with the CCC but to use their facilities as farm storage.

Most of the smaller elevators have had handling agreements with the CCC to load out the grain from farm storage facilities. Their capacities have been so limited that it has been of minor importance for the storage of grain over a long period of time.

Elevators operating under storage agreements. Commercial storage agreements have been of two types. For storage purposes, rice has been separated from the other grains and contracted under a rice storage agreement. All other grains have been handled under what has been known as a uniform storage agreement. Commercial facilities have been contracted under one or the other of the agreements even though the elevators may have been adapted to storage of both groups of grain. Since most of the contracts between the elevators and the CCC have been for only a year, the elevators capable of handling both rice and the other grains have had opportunities to reallocate part or all of the facilities to the other grains. Usually, however, the elevators were constructed to handle specific grains and have not been readily converted from one group of grains to the other. Therefore, the elevators under storage agreements have been separated into two groups, corresponding to the type of agreement under which they operated in 1954.

Still another classification has been made of the commercial elevators under storage agreements. The type of ownership has had vast influence on the operating policies of the elevators. Table 15 has been devised to present a view of th ownership of elevators under each type of agreement in 1954.

Even though only half of the commercial elevators under uniform grain storage agreements were cooperatively owned, this group included nearly two-thirds of the capacity in 1954. Rice elevators, on the other extreme, were

Table 15. Number and capacity of grain elevators contracted by the CCC under uniform grain storage and rice storage agreements, by types of ownership, 1954.*

Type of ownership	Elevators contracted under uniform grain storage agreements				Elevators contracted under rice storage agreements**			
	No. of elevators	Total capacity of elevators	Average capacity of elevators	Percent of total	No. of elevators	Total capacity of elevators	Average capacity of elevators	Percent of total
		1,000 bushels	1,000 bushels			1,000 bushels	1,000 bushels	
Cooperatives	6	916.2	152.7	63.6	2	475.6	237.8	20.7
Individually-owned businesses and corporations	6	524.1	87.4	36.4	10	1,818.0	181.8	79.3
TOTALS	12	1,440.3	—	100.0	12	2,293.6	—	100.0

Source: United States Department of Agriculture, Commodity Stabilization Service, Commodity Office, Reports "Warehouses Approved Under Uniform Rice Storage Agreements," (Mimeographed), April 1, 1955, and "Warehouses who have executed CCC Form 25, Uniform Grain Storage Agreements, or CCC Form 38-3, Agreement for Handling of Grain Through Country Elevators, with CCC," (Mimeographed), January 3, 1955, Dallas 26, Texas.

*Elevators at Natchez and Vicksburg excluded for reasons mentioned previously.

**Included facilities for storing both bulk and sacked rice.

mostly privately-owned businesses and corporations. However, a total of 847,000 bushels of the capacity owned by individuals and corporations was not facilities for handling bulk grain but only for storing sacked rice.

Under both types of storage agreements, the average capacity for the cooperatively-owned elevators was larger than that owned by individuals and corporations. This difference in size can probably be acredited to the purpose for which the facilities were constructed. Most of the elevators owned by individuals and corporations were constructed more for buying and selling operations than they were as storage facilities for farmers. In contrast, the cooperatively-owned facilities were erected primarily as storage facilities for government loans and as assembling points for marketing farmers' grain.

Elevators not under storage agreements. A few elevators were not under storage or handling agreements in 1954. The capacities of these facilities were of varying sizes and were often erected for storage or marketing of a specific crop. Usually these facilities have been owned on a limited partnership basis or as corporations by farmers or by a large processing firm of the specific crop handled by the elevator.

Most of these elevators have been eligible for storage agreemnts. However, the elevators which are limited partnerships or corporations owned by farmers usually preferred not to come under such agreements but to obtain loans on their grain as if it were in farm storage facilities.

The significance of these elevators as marketing and storage facilities has been hard to determine because of the degree to which they have specialized and because many were so small that no measure has been made of their capacities.

Elevators under handling agreements. Elevators in either of the above two groups with receiving and loading-out facilities have been eligible for handling agreements with the CCC. Elevators under uniform grain storage agreements may or may not have a handling agreement because they actually perform handling functions along with storage operations. In contrast, an elevator can contract for the handling functions without performing the storage operations.

Handling agreements have not been classified by types of grain as have the storage agreements. As mentioned earlier, many of the smaller elevators have been contracted under this agreement. Most of the facilities have had only enough capacity to assemble several kinds of grain in carload lots. In 1954 there were six such elevators with an average of 32,500-bushel storage capacity. All were owned by individuals or corporations. Probably the reason none were cooperatively owned has been that most of the cooperative elevators have performed handling operations for their patrons.

Farm storage facilities. Since only a small part of the grain produced in Mississippi has gone into government loans, storage facilities for the grain which has not gone into the loan have also created a problem. This grain has been stored for later use on the farm or for sale at the time when prices were more favorable. Facilities for the grain stored for other than loans have been composed of the conventional bins and cribs.

Shortage of storage facilities eligible for storing grain for loans, however, has caused grains to be sold at prices far below what could have been obtained had facilities been available. Therefore, the major part of this section has been devoted to a description of the facilities which have been eligible for storing grain in the loan.

Facilities on farm for grain stored for CCC loans. Facilities discussed in this section as farm storage have covered all those in which grain has been stored for a government loan other than elevators under storage agreements. According to the loan contracts between farmers and the CCC, the farmers have been responsible for the condition and amount of grain stored in farm facilities. However, in some instances, farmers have been able to pass part, if not all, of this responsibility to others by storing in commercial bins and elevators not under storage agreements.

Elevators with storage agreements have had to come up to certain specifications outlined and then approved by the CCC. Farm facilities, however, have been the responsibility of the county ASC committees. Specifications for the facilities have not been very well outlined by the CCC but have been left to each county committee. This lack of regulations has resulted in vast variations from one county to the next as to what has constituted an eligible facility for a loan.

Probably the best division of farm facilities classified as on-the-farm would be into elevators not under storage agreement which store for farmers, commercial bins, metal bins on the farms, and all other elegible farm structures. Actually what has constituted eligible farm storage facilities in a particular county has been defined by the county committee in that county. In 1954, farm storage in Mississippi varied all the way from only steel bins in some counties, to practically any wooden structure which kept the grain off of the ground and had a roof to keep out precipitation in others. Therefore, what did and did not constitute eligible farm storage in 1954 has not been clearly defined.

Since the elevators without storage agreements, commercial bins, and steel bins on farms have already been discussed, no further mention has been made in this section. However, some of the types of other farm structures have been listed.

Most of these other structures have consisted of wooden bins, converted tenant houses, old plantation stores, and so on. A few Quonset-type facilities have been erected in the Delta for rice storage. As far as durabiltiy has been concerned, these Quonset buildings would rank near that of the steel bins.

Facilities on farm for grain not stored for CCC loans. Thus far, all of the discussion has consisted of a description of the grain storage facilities which have been eligible for storing grain under government loans. In 1954 only about 14 percent of the corn, oats, wheat, barley, soybeans, and rice produced in Mississippi went into storage for government loans. Probably part of the grain, not stored for the loan, was marketed at harvest and taken from the state. The major portion, however, did not leave Mississippi but was stored in bins and cribs for livestock feed or for sale later.

Except for part of the oat and rice crops in 1954, farmers have managed to store most of the grain crops in the past. Those who did have to sell their grain at harvest usually received much less than they would if they had been able to have stored beyond the seasonal slump in prices at harvest. Simply because farmers have managed to store most of their grain does not necessarily indicate that sufficient storage facilities have existed.

One of the major complaints by county extension and ASC personnel, when interviewed in 1954 concerning storage facilities, was not so much that the capacity of the facilities has been inadequate but that existing facilities were sub-standard. Probably the worst defect of these structures has been the inability of farmers to control insects and rodents. Most of the facilities have not been constructed tightly enough for fumigation for insects and for the control of rats and mice.

Capacity and Distribution of the Storage Facilities

A measure of the capacity and distribution of the storage facilities in Mississippi has been complicated by the various classification of facilities and by the difficulty of obtaining information. The data on capacity of facilities under the storage agreements were obtained by personal interviews and from materials furnished by the CCC. The capacity of most forms of farm storage has not been so easy to estimate.

The capacity and distribution of facilities has been discussed as elevators under storage and handling agreements and as farm facilities. Rather definite data were obtained on the capacity of the elevators under storage and handling agreements. However, only limited data were available on farm facilities.

Elevators with handling and storage agreements. Even though accurate data were available for the volume of the elevators under storage agreements, operating methods have prevented this volume from becoming the effective storage capacity. Actually, the elevators normally have been able to store only about 85-90 percent of their stated capacity or even less if an elevator has a handling agreement also. About 10-15 percent of the capacity of the elevators has been kept vacant to allow room for turning the grain to prevent spoilage.

The amount of unused capacity has depended upon the type of elevator and kind of grain stored. Usually this unused capacity has consisted of one elevator bin. The amount of turning, of course, has depended upon the grain stored and its moisture content.

Another factor which has caused the effective capacity to be below that stated in the storage agreement has been elevators with handling agreements in combination with storage agreements. Loading out grain directly from the farm has often involved assembling some grain in the elevators to obtain car-loads of grain of the same grade. Of course, the vacant bin for turning the stored grain has been used to a certain extent for this purpose.

Mention should be made of the purchase agreement programs by the government. Under these programs, the CCC takes possession of the grain directly from the farmer without first obtaining a loan. The storage facilities used until the time the CCC takes possession of the grain have been those selected by the farmers regardless of whether the facilities would have been eligible for storing grain in the loan or not. Since grain handled in this manner has had to be shipped at the same time as that stored for a loan in elevators and on the farm, it has served to add pressure on the elevators already operating at near full capacity.

Figure 7 gives some indication of the volume and distribution of the elevators under storage and handling agreements. The elevators in each county have been grouped by the type of storage operation which they have contracted to perform. The distribution of the elevators indicates that practically all commercial storage facilities in Mississippi have been located in the Delta. Except for the elevator at Natchez, the center of concentration has been around Washington County. Most of the commercial facilities in this county have been the large rice elevators at Greenville.

Most of the Delta and Brown Loam Counties which had no elevator in 1954 had a large number of farm storage facilities, Figure 8. A combination of these facilities, Figures 7 and 8, as shown in Figure 9 indicates fairly distinctly the commercial grain area of Mississippi, with the exception of the Northeast Praire. However, much of the grain produced in the Northeast Prairie has been for livestock feed.

The elevators at Vicksburg and Natchez were included in Figure 7, even though they have been of little value as storage for farmer-owned grain. The agreement held by the elevator at Vicksburg has allowed it to store for farmers; however its chief value, as has the one at Natchez, has been to handle grain already owned by the CCC and as an outlet for Mississippi grain. The elevator at Vicksburg has been operated in combination with grain-processing operations. Not only has the elevator at Natchez been an important outlet for Mississippi-produced grain at harvest but also an inlet for the deficit grains, especially corn.

Farm storage facilities. The capacity of farm storage facilities has not been as easily estimated as it has for commercial facilities. Attempts were made to obtain estimates of the storage facilities on the farms which would be eligible for storing grain for a government loan, in the event the farmer desired such storage. As mentioned previously, storage qualifications have been too variable from one county to the next for such an estimate to be of any significance. Often during the summer of 1954, extension and ASC

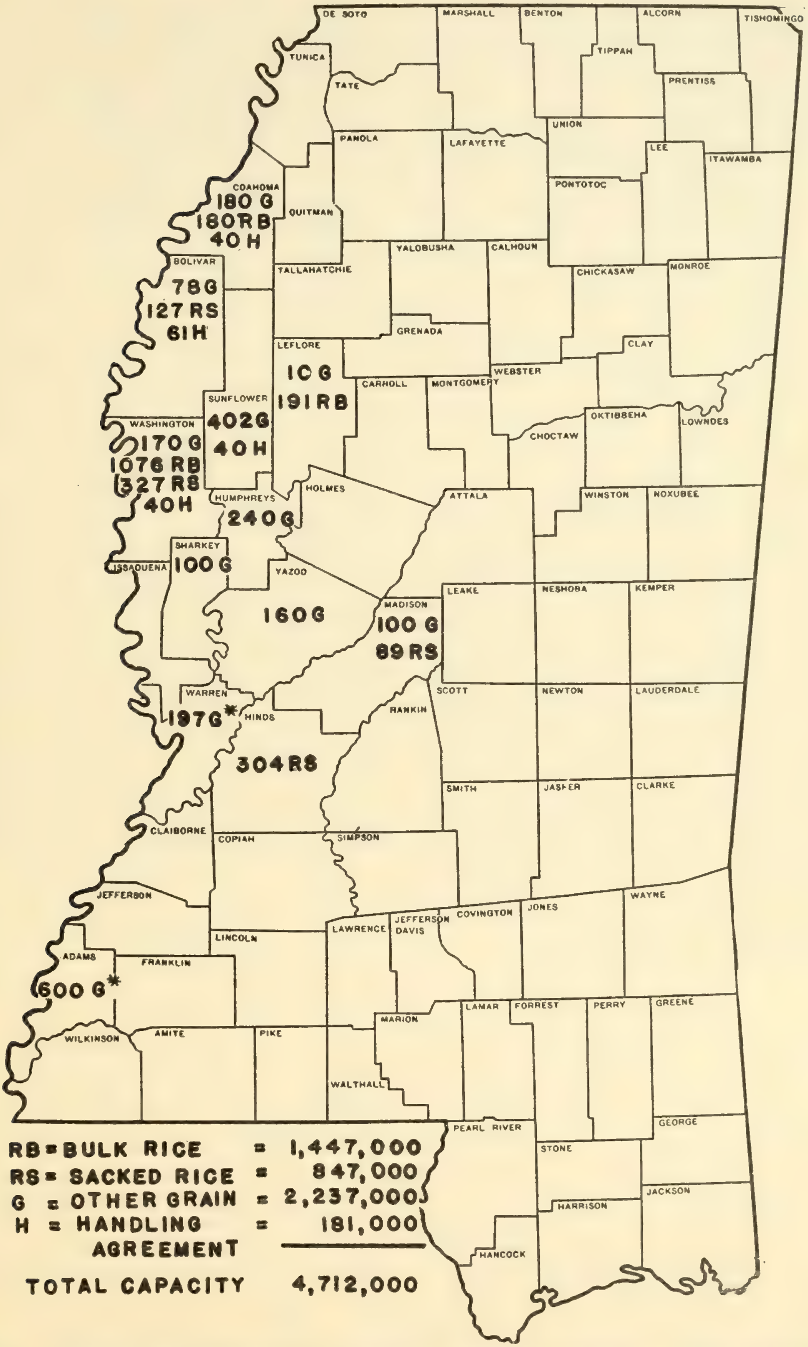
DE SOTO
MARSHALL
BENTON
ALCORN
TISHOMINGO
TUNICA
TIPPAH
TATE
PRENTISS
UNION
PANOLA
LAFAYETTE
LEE
ITAWAMBA
COAHOMA
180 G
180 RB
40 H
QUITMAN
PONTOTOC
YALOBUSHA
CALHOUN
BOLIVAR
78 G
127 RS
61 H
TALLAHATCHIE
CHICKASAW
MONROE
GRENADA
CLAY
LEFLORE
10 G
191 RB
WEBSTER
CARROLL
MONTGOMERY
SUNFLOWER
402 G
40 H
WASHINGTON
170 G
1076 RB
327 RS
40 H
OKTIBBEHA
LOWNDES
CHOCTAW
HOLMES
HUMPHREYS
240 G
ATTALA
WINSTON
NOXUBEE
SHARKEY
100 G
ISSAQUENA
YAZOO
160 G
MADISON
100 G
89 RS
LEAKE
NESHOBA
KEMPER
WARREN
197 G*
HINDS
304 RS
RANKIN
SCOTT
NEWTON
LAUDERDALE
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
JEFFERSON DAVIS
COVINGTON
JONES
WAYNE
LAWRENCE
LINCOLN
ADAMS
FRANKLIN
600 G*
LAMAR
FORREST
PERRY
GREENE
MARION
WILKINSON
AMITE
PIKE
WALTHALL
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK
RB = BULK RICE = 1,447,000
RS = SACKED RICE = 847,000
G = OTHER GRAIN = 2,237,000
H = HANDLING AGREEMENT = 181,000
TOTAL CAPACITY 4,712,000

Figure 7. Capacity and distribution by counties of elevators under rice, uniform grain storage, and handling agreements in Mississippi, 1954.
*Terminal and sub-terminal elevators.

personnel being interviewed would admit that an estimate of the facilities within the county would be little better than a wild guess.

The only accurate measure of farm facilities with state-wide acceptance as storage for government loans has been of those purchased through the government farm storage facility loan program. These facilities have by no means been the only ones of their kind in the state because many have been purchased through other means. Since no record of facilities obtained by other methods has been kept and no reliable estimates were available, these other facilities could not be measured. No doubt many wooden structures, which have come up to storage specifications, have been built on farms.

Realizing that the data are far from complete, Figure 8 was devised to show the capacity and distribution of farm storage facilities purchased with government loans. The commercial bins at Booneville, Prentiss County, were added to those purchased through loans. As the bins at Greenwood, Leflore County, have been farmer owned, probably a large part of them have been included in the total county capacity.

Since the program of loaning to farmers for the purpose of purchasing storage facilities was initiated, 1,341 loans have been made in Mississippi for a total of 5,865,257 bushels of storage capacity at a cost of $2,096,649. The average loan has been for $1,563 for 4,374 bushels of storage capacity at a cost of $.28 per bushel capacity.[14] The cost data are of little significance because the maximum loans have only covered 80 percent of the cost of construction of the facilities. About one-third of the facilities mentioned above was erected between April 15, 1954, and February 15, 1955.

The distribution pattern in Figure 8 has not varied far from the one for commercial facilities. However, farm facilities in Figure 8 have begun to spread out into the Brown Loam Area. Another interesting observation is that more loans have been made in the Delta counties where there have been no commercial facilities.

Storage Facilities and CCC Grain Loans in 1954

To present a brief view of how the balance between storage facilities and loans stood in 1954, Figure 9 was developed. If storage facilities had actually operated in 1954 in the way Figure 9 indicates, they would have been adequate.

As pointed out before, the effective storage capacity of elevators has been only 80-90 percent of its stated capacity mostly due to turning of the grain to prevent spoilage and to handling agreements. Also some of the elevators have been specialized and have not been able to handle all of the grains. A good example of these specialized facilities has been those for handling sacked rice. Distribution of facilities has always had an important effect upon their usefulness. One of the elevators has been operated such that the farmers have removed their oats before the maturity date of the loans in order to store soybeans.

An operational problem has also reduced the useful capacity of elevators, especially in the ones cooperatively-owned. The difficulty of allocating storage capacity to the patrons has involved all types of complications. In many instance, storage capacity has been wasted by the system of allocation. In some of these cases, the farmers have had to pay for their unused capacity; but in other instances, they have not.

Closely related to the problem of allocation of storage capacity has been the decision on which crop to by-pass and which to store. Some of the cooperative elevators have gone practically empty because of a decision by the manager and board of directors not to store oats but to wait for soybeans. Then when harvest came, the price of soybeans would be above the loan price, and farmers would sell on the cash

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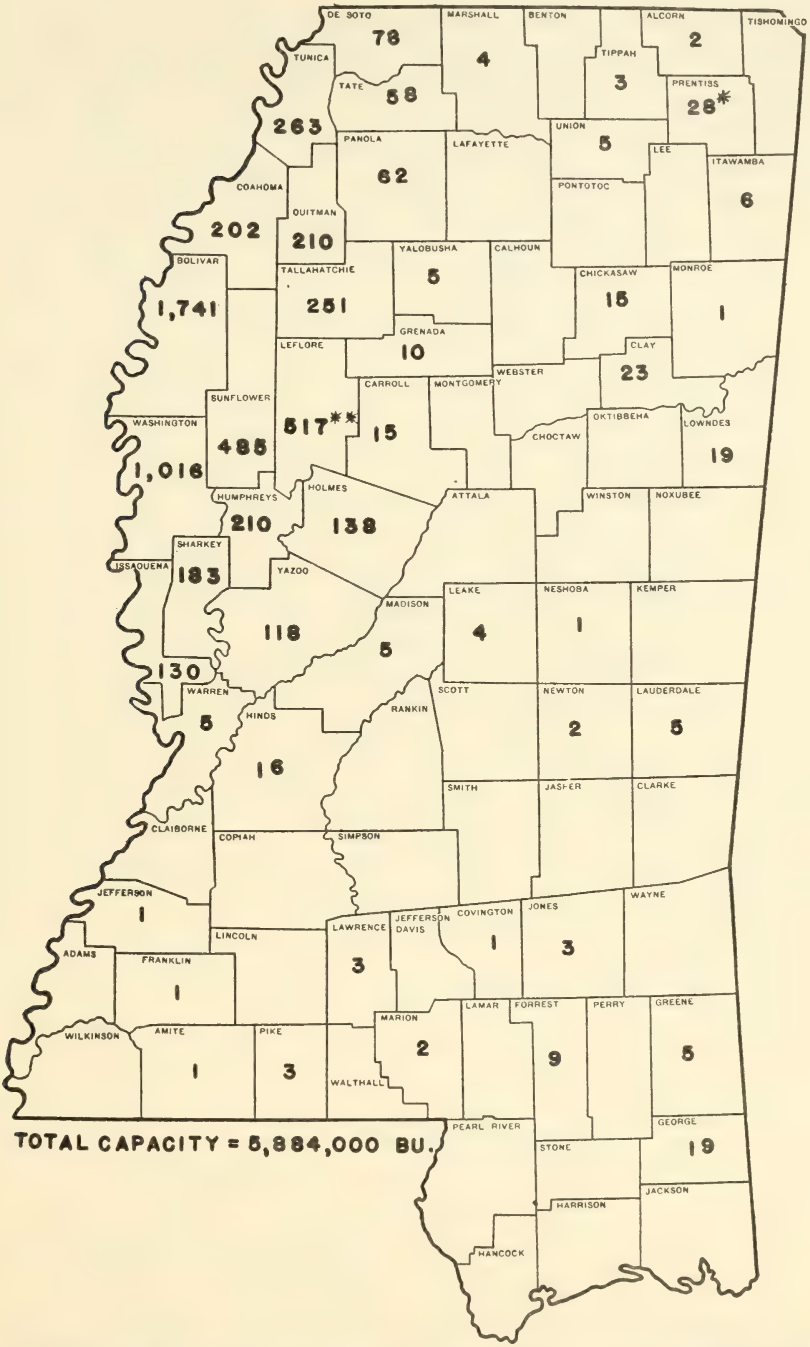
[14] Memorandum, "Summary of Loans Disbursed Under Farm Storage Facility Loan Program Up to February 15, 1955", Mississippi ASC State Office, Jackson, Mississippi, March 9, 1955.


DE SOTO
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MARSHALL
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TISHOMINGO
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TATE
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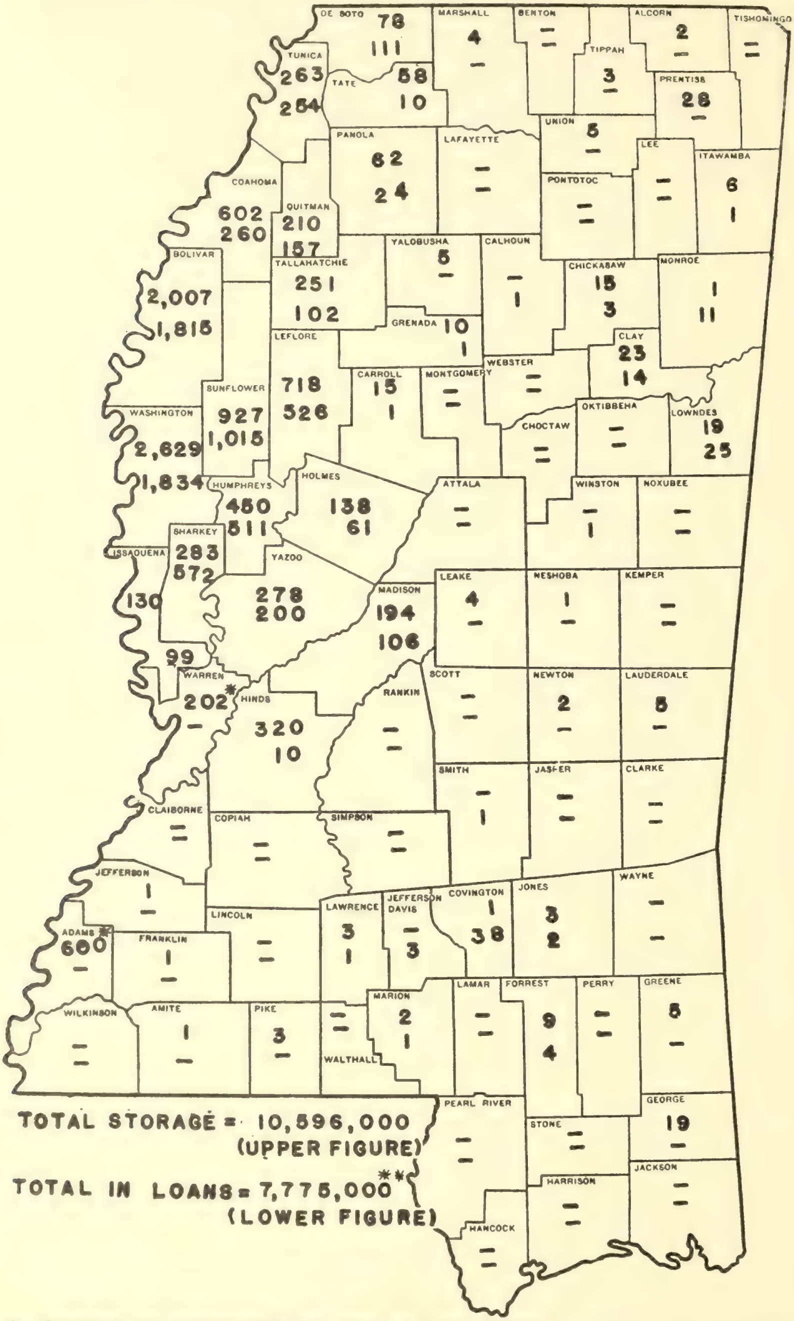
PRENTISS
28*
263
UNION
5
PANOLA
62
LAFAYETTE
LEE
ITAWAMBA
6
COAHOMA
202
PONTOTOC
QUITMAN
210
YALOBUSHA
5
CALHOUN
BOLIVAR
1,741
TALLAHATCHIE
251
CHICKASAW
15
MONROE
1
GRENADA
10
LEFLORE
CLAY
23
CARROLL
MONTGOMERY
WEBSTER
SUNFLOWER
WASHINGTON
485
517**
15
OKTIBBEHA
LOWNDES
19
CHOCTAW
1,016
HUMPHREYS
210
HOLMES
138
ATTALA
WINSTON
NOXUBEE
SHARKEY
183
ISSAQUENA
YAZOO
118
MADISON
5
LEAKE
4
NESHOBA
1
KEMPER
130
WARREN
5
HINDS
16
RANKIN
SCOTT
NEWTON
2
LAUDERDALE
5
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
1
WAYNE
JONES
3
COVINGTON
1
JEFFERSON DAVIS
LAWRENCE
3
LINCOLN
ADAMS
FRANKLIN
1
MARION
2
LAMAR
FORREST
9
PERRY
GREENE
5
WILKINSON
AMITE
1
PIKE
3
WALTHALL
TOTAL CAPACITY = 5,884,000 BU.
PEARL RIVER
STONE
GEORGE
19
HARRISON
JACKSON
HANCOCK

Figure 8. **Capacity and distribution by counties of commercial bins and farm storage facilities purchased through the farm storage facility program in Mississippi, February 15, 1955.**

*Includes 19,000 bushels in commercial bins owned by cooperative.

**Includes only those commercial bins purchased with government loan.


DE SOTO
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ALCORN
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TISHOMINGO
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TUNICA
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254
TATE
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TIPPAH
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PRENTISS
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UNION
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PANOLA
62
24
LAFAYETTE
–
–
LEE
–
–
ITAWAMBA
6
1
PONTOTOC
–
–
COAHOMA
602
260
QUITMAN
210
157
YALOBUSHA
5
–
CALHOUN
–
1
CHICKASAW
15
3
MONROE
1
11
BOLIVAR
2,007
1,815
TALLAHATCHIE
251
102
GRENADA
10
1
CLAY
23
14
LEFLORE
718
526
CARROLL
15
1
MONTGOMERY
–
–
WEBSTER
–
–
SUNFLOWER
927
1,015
WASHINGTON
2,629
1,834
OKTIBBEHA
–
–
LOWNDES
19
25
CHOCTAW
–
–
HOLMES
138
61
HUMPHREYS
450
511
ATTALA
–
–
WINSTON
–
1
NOXUBEE
–
–
SHARKEY
283
572
ISSAQUENA
130
99
YAZOO
278
200
MADISON
194
106
LEAKE
4
–
NESHOBA
1
–
KEMPER
–
–
WARREN
202*
–
HINDS
320
10
RANKIN
–
–
SCOTT
–
–
NEWTON
2
–
LAUDERDALE
5
–
SMITH
–
1
JASPER
–
–
CLARKE
–
–
CLAIBORNE
–
–
COPIAH
–
–
SIMPSON
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–
JEFFERSON
1
–
LINCOLN
–
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LAWRENCE
3
1
JEFFERSON DAVIS
–
3
COVINGTON
1
38
JONES
3
2
WAYNE
–
–
ADAMS*
600
–
FRANKLIN
1
–
WILKINSON
–
–
AMITE
1
–
PIKE
3
–
WALTHALL
–
–
MARION
2
1
LAMAR
–
–
FORREST
9
4
PERRY
–
–
GREENE
5
–
PEARL RIVER
–
–
GEORGE
19
–
STONE
–
–
JACKSON
–
–
HARRISON
–
–
HANCOCK
–
–
TOTAL STORAGE = 10,596,000
(UPPER FIGURE)
TOTAL IN LOANS = 7,775,000**
(LOWER FIGURE)

Figure 9. Capacity of commercial and farm storage facilities, and quantity of corn, oats, wheat, barley, rice, and soybeans stored for CCC loans in Mississippi, 1954.

*Includes 797,000 bushels of terminal and sub-terminal elevators.

**Grain in loan as of January 15, 1955. Data from the files of the Mississippi ASC State Office.

market probably because they considered any price near or above the loan rate as acceptable. Also many of the farmers probably sold their soybeans at harvest, when the price was near that of the loan, because they needed the receipts for operating purposes.

Still another obstacle has often developed in commercial storage. Sometimes the previous year's crop has not been moved out by the CCC in time to store grain produced in the current year, or the old crop has had to be shipped at the same time the new crop was coming into storage.

As far as commercial facilities have been concerned, Figure 9 may be a bit deceiving because grain stored in such facilities often crosses county lines, but farmers receive their loans from the county in which the grain was produced. This helps to account for the overbalance of facilities in some counties and under-balance in others.

Another factor which has caused complications in Figure 9 has been that there was no way to determine how many of the farm facilities purchased through government loans were actually used to store grain for loans. In many instances in the Upland areas of the state, there are indications that these facilities were not used at all. The major difficulty of determining the adequacy of storage facilities, however, has been the inability to measure the capacity of other types of farm storage.

Figure 9 shows the volume of the grains going into the loan and the capacity of most of the eligible storage facilities. What has not been determined is how much more grain would have gone into the loan had facilities been available, or how much of the grain which went into the loan would have gone into the cash market had adequate marketing facilities been available to have offered a more enticing price.

Operating Policies of Elevators

Operating policies have been mentioned briefly under various other headings. These policies should at least be mentoned in rather general terms to illustrate some of the attempts by elevator managers and farmers to be assured of a stable storage program.

A discussion of operating policies requires the same classification of facilities as developed under ownership - coperatives and privately-owned businesses or corporations. Even in this division of storage facilities, policies have not been very distinct for each type of ownership.

Cooperatives. Practically all of the cooperatives have used some system of allocation of storage capacity. Usually this has been on the basis of so many bushels of storage per share of stock. If the rate of storage per share were low enough so that the entire capacity were not allocated, the remainder has been available for use by nonmember farmers.

About half of the cooperatives have been holding the farmers responsible for their allocated capacity. If the farmers do not release their excess capacity by a certain date, they have been charged a certain prearranged fee per bushel of capacity not used.

The idea of handling any farmer's grain was tried but failed when more grain was produced in the immediate area than the elevator was able to handle. One elevator received grain from all farmers in the area with the agreement that the managment would have the authority to sell all of the small grains in time to store soybeans. The elevator disposed of the non-stockholder's grain first under this arrangement. This allowed more time to find better markets for the stockholders' grains and also to hold the small grains long enough to determine if more income could be made by continuing to hold the small grains instead of soybeans.

Privately-owned businesses and corporations. Usually the elevators, other than cooperatives, have not been interested in whose grain they have stored. However, some have agreed to store so many bushels or a certain percent of a farmer's grain crop. Indications were that in certain cases there has been an understanding that the farmer would sell the remainder of the crop to the elevator. Such understandings have usually been stated in the form that the elevators would buy the remainder of the crop, rather than that the farmer must sell to the elevator. An arrangement, such as this, could prove very profitable to an elevator in the event the remainder of the crop were purchased at the seasonal low price being paid in the local area, rather than the one quoted in the commodity exchanges. Naturally, to what extent, if at all, such practices have been in operation, could not be determined. Indications were that the practice was not followed now to the extent it once was, probably because farmers were more aware of the effect of such practices.

One rice elevator made contracts with farmers for a five-year period, in order to assure them of a certain percent of the elevator's capacity. The farmers have contracted for an equivalent of 50 bushels of rice per acre for an established number of acres. This type of arrangement has assured both the producers and elevator owners of a stable operation. In this case, farmers have been held responsible for the amount of storage capacity contracted and have paid for the unused capacity at the same rate as that utilized.

One corporation owned by a group of farmers has operated much as a coperative. This elevator has been allocating its capacity on the basis of so many bushels per dollar of stock. By operating the business in this manner, the earnings have been divided among the stockholders on the basis of stock held. Since storage capacity has also been allocated on the same basis, dividends, in a sense, have been equivalent to patronage refunds from a cooperative. Also the stockholders have received the income realized from storing grain for non-stockholders.

One soybean elevator was a corporation of six or eight farmers who erected their own storage and crushing facilities. The elevator had not been under a storage agreement but had been eligible for a contract in the event the farmers did not produce enough to use it to capacity. Without a storage agreement, loans on soybeans have been classified as on-the-farm.

Under both types of ownership, cooperative and privately-owned or corporation, basically the same problems have been involved. To be of greatest value, elevators must be used to near their capacity every season. Farmers must be assured of storage and marketing facilities in order to produce a commodity. The elevator operators have attempted to assure both themselves and the grain producers of a stable grain storage program by some of the various means mentioned above.

SUMMARY AND CONCLUSIONS

The pattern of agricultural production in Mississippi has been undergoing a change within recent years. Though cotton still maintains its place as the state's leading source of agricultural income, its position is being challenged by increases in receipts from other farm sources. Part of this gain is accounted for by expanded receipts from the sale of livestock and livestock products. The grain crops—oats, wheat, barley, corn, rice and soybeans—have also been accounting for a higher proportion of the total cash farm income.

If grain production is to continue to expand in Mississippi, marketing and storage facilities must keep pace. An analysis of seasonal prices for the grains indicates that this has not been the case. The common occurrence of a price slump at harvest signifies that marketing and storage facilities for grain in Mississippi have been inadequate.

This study was made to determine the adequacy of such facilities. Its objectives were to determine the present needs for marketing and storage facilities, and to project probable future needs. In addition to a survey of existing facilities, the work included a study of grain production and utilization, over time, to determine the trend in the supply of feed and in the amount needed for feed.

Oat, barley, and soybean production have been increasing rather rapidly in Mississippi. Corn production has tended to become stabilized even though in most recent years there has been a deficit supply. With wider use of improved cultural practices and limited irrigation, corn production may be expected to increase, provided adequate marketing and storage facilities become available. Expansion of rice production has been retarded at present by acreage restrictions. Removal, or modification, of these restrictions would, in all probability, mean rapid expansion in the production of this crop. Wheat production is in somewhat the same position as rice. With indications, even under existing conditions, of needs for additional marketing facilities to handle the increasing supply of commercial grains, the relaxing of rigid production controls would push these needs even higher.

Mississippi's large livestock and poultry inventories indicate that more grains will be needed for feeds. Broiler production has made rapid gains in the State since 1950, requiring an abundance of shelled, yellow corn. Cattle and sheep numbers have been increasing steadily in recent years and, especially in the case of dairy cattle, have required more of the feed grains. Hog numbers began an up-turn in 1955, after declining for several years. This has added to the feed grain needs, particularly corn. Horse and mule numbers have been decreasing steadily, and this trend may be expected to continue. Since a large portion of the oats produced in the Delta has been used as feed for workstock, the decline in workstock inventories will release more of the grain for the market. While an expanded livestock program will call for more feed grains, production of some of the grains may increase faster than the feed requirements for livestock.

There are usually appreciable differences in grain prices at harvest and at other seasons of the year. During the period 1947-54, the seasonal price spread for soybeans averaged 76 cents per bushel. The average seasonal price spread per bushel for oats was 18 cents; for corn, 27 cents; and for wheat, 23 cents. Price peaks for most grains normally occur within nine months after harvest. Commercial storage and handling charges per bushel for nine months, based on 1954 rates, were 22 cents for soybeans; 12 cents for oats, 17 cents for corn; and 22 cents for wheat. Although storage charges for years other than 1954 were not ascertained, these differences between peak prices and charges would imply that, provided storage charges maintained approximately the same relationship to prices throughout the period, grain producers could have netted additional profits through storage operations. The difference between the eight-year average seasonal price spread and commercial storage charges for nine months was 54 cents for soybeans, 6 cents for oats, 10 cents for corn and 1 cent for wheat. At Booneville, where storage charges were made on a twelve-month basis, there were still greater differences between seasonal price spreads and storage charges. Here these differences were: for soybeans, 67 cents; for oats, 9 cents; for corn, 18 cents; and for wheat, 14 cents.

Storage facilities approved for CCC-loan grain in Mississippi may be classified as commercial elevators and on-the-farm facilities. Basis for classification was the type of government loan received on the stored grain, rather than the type or location of the structure. CCC-approved commercial elevator storage capacity in the state was approximately 4.71 million bushels at the end of 1954. This included capacities of 181,000 bushels in elevators with handling agreements only, 797,000 bushels in terminal and sub-terminal elevators, and 847,000 in structures suitable for handling sacked rice only. Of the remaining 2.9 million bushels of approved capacity, only 80 to 90 percent could be considered effective storage capacity, due to operating methods which require excess turn-over space.

No definite quantitative measure of on-the-farm storage potential could be made. The policy of ASC county committee approval of facilities for this purpose has resulted in wide variations of specifications for approved farm storage structures and thus renders this capacity most difficult to measure. The only accurate measure of farm storage facilities ascertainable was the 5,865,257-bushel capacity of structures purchased through government loans, and a commercial bin capacity of 19,000 bushels.

Total storage capacity, including both commercial and measurable on-the-farm facilities, was approximately 10,596,000 bushels in 1954. By January 15, 1955, approximately 7,775,000 bushels of grain, or about 14 percent of Mississippi's 1954 grain crops, had been stored under government loans. The existence of an unused approved storage capacity of nearly three million bushels did not, however, necessarily mean that effective capacity was ample. Less than half of the 4.71 million-bushel capacity in commercial elevators was effective storage capacity. Not all of the farm facilities purchased through government loans were used. Many of the storage facilities have had very limited use due to their location in areas distant from commercial grain production areas. A market price for oats at harvest averaging 21 cents below the loan rate in 1954 is evidence of the extent of inadequate facilities.

The center of concentration of storage facilities has been around Washington County in the Delta and has spread out toward the Brown Loam Area. Large numbers of on-the-farm storage facilities are in counties having few or no elevators. The Delta and Brown Loam counties have been the major commercial grain areas, followed by those in the Northeast Prairie. No organized outlet for cash grain has been developed in the Northeast Prairie except through CCC loans for farm-stored grains.

Shortages of storage space were found not only for commercial grain, but also for grain for farm use. More substantial storage structures are needed for farm feed grains to permit effective insect and rodent control

Grain production will probably become a more important part of Mississippi's agricultural pattern, along with the various livestock enterprises. High cotton yields in the West can be expected to exert pressure on cotton producers in Mississippi, forcing them to turn to other sources of cash income. If this expansion is to take place, elevators must be erected at which producers may receive either an equitable price or a bonded warehouse receipt for their grains.

Most farmers must have cash for their crops soon after harvest to cover operating expenses. The development of an adequate marketing system in the state would facilitate the securing of loans on stored grains, while at the same time making it possible for more producers to retain equity in the grain for sale at a higher seasonal price. Facilities which would perform these functions are needed over most of the commercial grain area of Mississippi. As the demand for facilities increases, investment opportunities in the construction of elevators should be attractive to both farmer cooperatives and individuals.

APPENDIX

Table 1. Five-year moving averages of farm cash receipts of Mississippi farmers expressed in percentages from 1924-53.

Farm products	1924-1928	1925-1929	1926-1930	1927-1931	1928-1932	1929-1933	1930-1934	1931-1935	1932-1936	1933-1937	1934-1938	1935-1939	1936-1940
Dairy products	4.4	4.8	5.9	7.1	8.2	8.7	8.9	8.6	7.5	6.9	6.7	6.9	7 2
Cattle, calves	2.9	3.1	3.4	3.5	3.7	3.7	3.7	4.4	4.3	4.4	5.0	5.8	6.1
Hogs	1.8	1.7	1.9	2.1	2.1	2.1	2.2	2.3	2.2	2.3	2.5	2.8	3.0
Eggs	2.6	2.6	2.9	2.9	3.0	2.9	2.7	2.7	2.3	2.3	2.5	2.6	2.7
Poultry	1.1	1.2	1.4	1.6	1.7	1.8	1.8	1.7	1.4	1.3	1.2	1.5	1.9
Other	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Total livestock and products	13.1	13.6	15.7	17.4	18.9	19.4	19.5	19.9	17.9	17.4	18.0	19.7	21.0
Field crops:													
Cotton lint	69.0	68.6	66.2	65.0	62.4	61 7	61.0	59 9	61.4	62.5	61.5	60.2	59.2
Cottonseed	8.4	9.0	9.2	8.4	8.2	7.8	8.1	8.5	10.0	10.6	11.2	10.8	10.3
Grain crops	0.4	0.4	0.3	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.8	0.9	1.1
Soybeans	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3
Truck crops	3.7	3.3	3.3	3.0	3.4	3.6	3.5	3.5	3.2	2.6	2.2	2.2	2.0
Other	1.9	1.9	2.1	2.4	2.9	3.3	3.6	3.9	3.7	3.3	3.2	3.0	2.9
Fruit and tree nuts	1.0	0.9	0.9	1.1	1.1	1.2	1.2	0.9	0.9	0.9	0.9	0.9	0.8
Forest, greenhouse, nursery	2.3	2.1	2.1	2.2	2.4	2.5	2.5	2.4	2.1	1.9	1.9	2.0	2.4
Total crops	86.9	86.4	84.3	82.6	81.1	80.6	80.5	80.1	82.1	82.6	82.0	80.3	79.0
Total crops and livestock	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Continued)

Table 1. Five-year moving averages of farm cash receipts of Mississippi farmers expressed in percentages from 1924-53.—(Continued)

Farm products	1937-1941	1938-1942	1939-1943	1940-1944	1941-1945	1942-1946	1943-1947	1944-1948	1945-1949	1946-1950	1947-1951	1948-1952	1949-1953
Dairy products	7.3	7.1	6.9	6.6	6.2	6.8	6.8	6.9	6.9	6.9	7.3	7.6	7.6
Cattle, calves	6.5	6.6	6.5	6.1	5.9	7.0	7.6	8.4	8.9	9.3	8.5	8.7	7.9
Hogs	3.0	3.1	3.3	3.4	3.4	3.7	3.9	3.8	3.7	3.7	3.7	3.7	3.6
Eggs	2.7	2.8	2.9	3.1	3.2	3.5	3.5	3.1	3.0	2.8	2.7	2.8	3.0
Poultry	2.1	2.2	2.6	2.7	2.9	3.2	3.2	3.1	3.1	3.1	3.3	3.9	4.2
Other	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Total livestock and products	21.7	21.9	22.3	22.0	21.7	24.4	25.2	25.5	25.9	26.1	25.8	27.0	26.6
Field crops:													
Cotton lint	58.5	58.2	57.9	58.2	58.7	55.8	55.3	55.2	56.1	56.0	57.5	56.2	57.2
Cottonseed	10.1	10.4	10.5	10.7	10.5	9.6	9.0	8.8	7.9	7.7	7.4	7.3	6.7
Grain crops	1.3	1.4	1.3	1.5	1.6	1.9	2.0	2.1	2.0	2.0	1.8	1.8	2.0
Soybeans	0.3	0.5	0.6	0.6	0.6	0.7	0.6	0.6	0.6	1.2	1.5	2.0	2.0
Truck crops	1.9	1.6	1.6	1.5	1.4	1.5	1.6	1.4	1.4	1.2	1.0	1.0	0.8
Other	2.8	2.8	2.8	2.7	2.8	3.4	3.3	3.2	3.0	2.7	2.0	1.8	1.9
Fruit and tree nuts	0.9	0.8	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.6	0.5	0.5	0.4
Forest, greenhouse, nursery	2.5	2.4	2.2	2.0	1.7	1.7	2.0	2.2	2.2	2.5	2.5	2.4	2.4
Total crops	78.3	78.1	77.7	78.0	78.3	75.6	74.8	74.5	74.1	73.9	74.2	73.0	73.4
Total crops and livestock	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: **Cash Receipts From Farming, By States and Commodities,** Calendar Years 1924-44, Washington, D. C., 1946; **The Farm Income Situation,** United States Department of Agriculture, Agricultural Marketing Service, Washington, D. C., 1945-54.

Table 2. Farm cash receipts of Mississippi farmers, 1924-53.

Farm products	1924	1925	1926	1927	1928	1929	1930	1931
				1,000 dollars				
Dairy products	7,021	7,380	9,001	10,442	12,186	13,455	12,095	9,304
Cattle, calves	4,923	5,336	5,949	6,831	7,516	7,851	5,086	3,438
Hogs	3,523	3,239	2,995	4,823	4,332	3,352	3,081	2,009
Eggs	4,394	4,991	5,940	5,529	5,848	5,737	4,641	2,771
Poultry	2,098	2,094	2,569	2,760	2,616	2,396	2,949	1,899
Other	520	553	576	582	532	308	315	191
Total livestock and products	22,479	23,593	27,030	30,967	33,030	33,599	28,167	19,612
Field crops:								
Cotton lint	131,022	201,648	108,060	157,065	143,233	158,431	93,237	45,427
Cottonseed	12,925	20,012	18,201	18,431	18,766	22,474	12,844	5,214
Grain crops	718	957	841	1,038	861	605	471	460
Soybeans	150	482	399	172	295	189	137	102
Truck crops	7,937	7,957	8,402	8,344	5,285	5,932	3,996	2,783
Other	3,250	4,034	3,895	4,240	4,211	4,699	3,411	2,987
Fruit and tree nuts	1,766	2,524	2,159	1,469	2,424	1,358	1,677	1,745
Forest, greenhouse, nursery	5,408	5,128	4,981	4,384	4,280	4,148	3,187	2,370
Total crops	163,176	242,742	146,938	195,143	179,355	197,836	118,960	61,038
Total crops and livestock	185,655	266,335	173,968	226,110	212,385	231,435	147,127	80,700

Farm products	1932	1933	1934	1935	1936	1937	1938	1939
				1,000 dollars				
Dairy products	7,120	7,094	8,110	9,387	10,750	11,713	10,891	9,676
Cattle, calves	2,983	2,848	3,951	9,379	6,856	8,082	9,344	9,655
Hogs	1,474	1,993	2,493	3,401	3,753	4,390	4,592	4,690
Eggs	2,155	1,912	2,358	3,601	3,885	4,240	4,850	3,366
Poultry	1,465	1,415	1,250	1,609	2,009	2,598	1,962	3,180
Other	169	191	201	170	189	247	143	114
Total livestock and products	15,366	15,453	18,363	27,547	27,442	31,270	31,782	30,681
Field crops:								
Cotton lint	40,940	54,715	81,476	75,352	120,628	104,830	87,940	78,843
Cottonseed	5,297	5,766	14,094	14,213	26,444	17,233	14,882	11,923
Grain crops	567	396	714	923	1,000	1,394	2,631	1,418
Soybeans	142	75	142	276	522	705	414	404
Truck crops	4,071	3,396	2,369	3,456	3,867	4,441	2,907	2,522
Other	3,506	3,141	4,668	4,869	4,660	4,872	4,602	4,297
Fruit and tree nuts	578	1,008	1,205	1,186	1,383	1,139	1,371	1,495
Forest, greenhouse, nursery	2,075	2,155	2,176	2,262	3,252	3,440	3,194	3,384
Total crops	57,176	70,652	106,846	102,537	161,756	138,054	117,941	104,286
Total crops and livestock	72,542	86,105	125,209	130,084	189,198	169,324	149,723	134,967

Farm products	1940	1941	1942	1943	1944	1945	1946	1947
				1,000 dollars				
Dairy products	9,506	12,490	15,783	19,667	22,394	23,332	26,989	30,301
Cattle, calves	9,075	11,357	14,257	19,055	18,530	26,152	32,894	41,964
Hogs	3,890	3,739	8,512	14,610	13,215	12,178	11,402	19,890
Eggs	3,359	4,638	7,388	12,548	11,918	12,175	11,632	12,608
Poultry	3,194	3,827	6,008	11,008	10,576	12,625	11,567	10,563
Other	135	154	190	288	346	755	1,224	1,340
Total livestock and products	29,159	36,205	52,138	77,176	76,979	87,217	95,708	116,671
Field crops:								
Cotton lint	55,789	121,855	161,155	190,393	215,953	183,023	140,681	281,082
Cottonseed	9,161	25,894	31,718	34,242	34,846	26,305	25,334	42,329
Grain crops	1,408	2,996	3,441	4,707	6,216	6,600	9,112	9,163
Soybeans	305	410	3,088	3,440	1,560	1,539	1,964	3,103
Truck crops	1,817	2,397	3,724	5,839	4,703	4,760	5,521	7,281
Other	3,082	4,268	7,211	9,358	10,202	11,679	15,052	12,417
Fruit and tree nuts	766	1,846	1,733	2,356	4,024	4,678	3,515	2,868
Forest, greenhouse, nursery	3,585	5,102	3.716	4,019	4,984	5,890	8,503	14,289
Total crops	75,913	164,768	215,786	254,354	282,488	244,474	209,682	372,532
Total crops and livestock	105,072	200,973	267,924	331,530	359,467	331,691	305,390	489,203

(Continued)

Table 2. Farm cash receipts of Mississippi farmers, 1924-53.—(Continued)

Farm products	1948	1949	1950	1951	1952	1953
			1,000 dollars			
Dairy products	34,429	29,157	33,649	60,067	42,100	44,628
Cattle, calves	50,703	37,695	47,759	38,314	52,150	37,597
Hogs	19,543	16,683	18,080	20,188	22,273	19,602
Eggs	12,284	12,456	14,933	17,470	16,304	20,145
Poultry	14,996	15,913	18,265	25,020	28,319	28,852
Other	1,695	2,050	1,559	1,696	1,603	1,617
Total livestock and products	133,650	113,954	134,245	162,755	162,749	152,441
Field crops:						
Cotton lint	309,557	315,024	266,756	293,471	280,452	413,887
Cottonseed	51,236	26,424	33,268	36,898	44,951	40,533
Grain crops	9,109	6,726	9,180	10,758	12,566	15,810
Soybeans	4,387	2,978	15,812	12,101	16,235	7,780
Truck crops	5,844	5,099	3,916	4,116	6,850	——
Other	11,152	9,329	8,809	8,445	9,603	15,385
Fruit and tree nuts	3,397	2,522	1,198	2,921	2,322	3,233
Forest, greenhouse, nursery	10,029	8,180	15,538	14,967	14,033	13,246
Total crops	404,711	376,282	354,477	383,677	387,012	509,874
Total crops and livestock	538,361	490,236	488,722	546,432	549,761	662,315

Source: **Cash Receipts From Farming, By States and Commodities,** Calendar years 1924-44, Washington, D. C., 1946; **The Farm Income Situation,** United States Department of Agriculture, Agricultural Marketing Service, Washington, D. C., 1945-54.

Table 3. Five-year moving averages of corn acreage, yield, and production in Mississippi, 1920-54.

Five-year moving averages	Corn			Five-year moving averages	Corn		
	Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)		Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)
1920-24	2,673	15.6	42,400	1936-40	2,781	14.9	42,578
1921-25	2,514	16.0	40,653	1937-41	2,839	15.4	44,915
1922-26	2,263	16.2	36,599	1938-42	2,899	15.3	45,679
1923-27	2,076	16.3	33,435	1939-43	2,843	15.2	44,505
1924-28	1,964	16.2	31,628	1940-44	2,803	15.9	45,853
1925-29	1,915	17.3	33,333	1941-45	2,757	17.1	46,953
1926-30	1,920	16.0	30,809	1942-46	2,596	17.0	43,995
1927-31	1,996	15.9	31,950	1943-47	2,468	16.9	41,594
1928-32	2,095	15.0	31,640	1944-48	2,353	18.6	43,601
1929-33	2,220	15.2	33,868	1945-49	2,240	20.0	44,701
1930-34	2,370	14.6	34,816	1946-50	2,198	20.7	45,410
1931-35	2,509	15.0	37,490	1947-51	2,110	21.7	45,745
1932-36	2,595	14.2	36,897	1948-52	2,004	21.6	43,814
1933-37	2,631	15.0	39,455	1949-53	1,857	21.2	39,692
1934-38	2,770	15.2	42,160	1950-54	1,762	20.0	35,596
1935-39	2,788	14.8	41,234				

Source: **Yearbook of Agriculture,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1920-35; **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1936-53; **Crop Production—1954 Annual Summary,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., December, 1954.

Table 4. Five-year moving averages of oat acreage, yield, and production in Mississippi, 1920-54.

Five-year moving averages	Oats			Five-year moving averages	Oats		
	Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)		Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)
1920-24	128	18.2	2,379	1936-40	91	30.1	2,831
1921-25	119	18.6	2,267	1937-41	138	32.1	4,602
1922-26	98	19.0	1,859	1938-42	187	32.5	6,116
1923-27	82	19.2	1,567	1939-43	235	32.8	7,563
1924-28	64	20.4	1,211	1940-44	301	33.0	10,035
1925-29	47	20.2	936	1941-45	354	32.8	11,622
1926-30	34	21.1	685	1942-46	370	31.8	11,824
1927-31	36	20.5	769	1943-47	393	31.8	12,520
1928-32	32	19.7	689	1944-48	399	32.4	12,917
1929-33	31	19.5	653	1945-49	363	31.1	11,277
1930-34	31	19.9	633	1946-50	301	29.9	9,164
1931-35	33	19.8	681	1947-51	252	29.5	7,599
1932-36	33	22.2	676	1948-52	203	30.9	6,392
1933-37	37	24.7	859	1949-53	189	32.3	6,277
1934-38	45	27.7	1,146	1950-54	230	34.2	8,315
1935-39	54	27.7	1,563				

Source: **Yearbook of Agriculture,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1920-35; **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1936-53; **Crop Production—1954 Annual Summary,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., December, 1954.

Table 5. Five-year moving averages of soybean acreage, yield and production in Mississippi, 1927-54.

Five-year moving averages	Soybeans			Five-year moving averages	Soybeans		
	Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)		Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)
1927-31	12	10.3	125	1939-43	105	11.1	1,266
1928-32	11	11.2	127	1940-44	109	11.8	1,366
1929-33	10	12.0	122	1941-45	114	12.4	1,450
1930-34	9	12.5	119	1942-46	114	13.3	1,510
1931-35	12	13.1	154	1943-47	92	13.3	1,208
1932-36	23	11.5	210	1944-48	90	14.5	1,346
1933-37	31	11.0	272	1945-49	94	15.3	1,472
1934-38	41	9.9	348	1946-50	149	17.7	3,101
1935-39	53	9.2	452	1947-51	224	17.3	3,996
1936-40	57	8.6	484	1948-52	296	17.2	4,959
1937-41	57	9.3	532	1949-53	319	16.0	5,080
1938-42	88	10.4	1,020	1950-54	401	14.6	5,709

Source: **Yearbook of Agriculture,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1928-35; **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1936-53; **Crop Production—1954 Annual Summary,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., December, 1954.

Table 6. Five-year moving averages of wheat acreage, yield and porduction in Mississippi, 1941-54.

Five-year moving averages	Wheat			Five-year moving averages	Wheat		
	Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)		Acres harvested (1000)	Yield Bu./A.	Production (1000 bu.)
1941-45	12	24.6	298	1946-50	12	21.8	270
1942-46	12	23.6	279	1947-51	11	22.4	245
1943-47	15	23.6	338	1948-52	9	23.0	200
1944-48	16	22.4	355	1949-53	15	23.9	377
1945-49	15	22.0	322	1950-54	18	25.1	481

Source: **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1943-53; **Crop Production—1954 Annual Summary,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., December, 1954.

Table 7. Rice acreage, yield, and production in Mississippi, 1949-54.

Year	Rice		
	Acreage harvested	Yields, bushel per acre	Production (bushels)
1949	5,000	60.0	300,000
1950	7,000	60.0	420,000
1951	27,000	54.4	1,471,100
1952	48,000	51.7	2,480,000
1953	53,000	54.4	2,884,444
1954	82,000	60.0	4,920,000

Source: **Agricultural Statistics,** United States Department of Agriculture, United States Government Printing Office, Washington, D. C., 1951-53; **Crop Production—1954 Annual Summary,** United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., December, 1954.

Table 8. Supply and utilization of corn by the various livestock enterprises in Mississippi, 1950 and 1954.

Livestock enterprise	1950			1954		
	Fed as corn	Corn in formula feed	Total corn fed	Fed as corn	Corn in formula feed	Total corn fed
			1,000 bushels			
Dairy	5,356	712	6,068	6,136	817	6,953
Beef	500	—	500	643	—	643
Sheep	36	—	36	50	—	50
Hogs	15,070	71	15,141	9,213	44	9,257
Poultry	7,499	3,431	10,930	7,499	4,948	12,447
Horses and mules	11,356	214	11,570	8,725	165	8,890
Other livestock	643	357	1,000	643	357	1,000
Total for livestock	40,460	4,785	45,245	32,909	6,331	39,240
Uses other than livestock feed			3,321			3,321
TOTAL UTILIZATION			48,566			42,561
Production from previous year			41,995			32,934
Difference between production and utilization			6,571			9,627
Status of stocks during year*			—2,216			+ 233
Deficit coming from out-of-state			4,355			9,860

Source: Jennings, R. D., **Feed Consumed by Livestock, Supply and Disposition of Feed,** 1949-50, United States Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 145, Washington, D. C., June, 1954; **Livestock and Poultry on Farm and Ranch,** January 1, United States Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D. C., 1951-55; **Crop Production,** United States Department of Agriculture, Agricultural Marketing Service, (Bureau of Agricultural Economics through November, 1953), Washington, D. C., October, 1950, October, 1954, and 1950 and 1954 Annual Summaries.

*October 1 stocks were used for the old crop to prevent combining of two years' production.

Table 9. Seasonal index of monthly prices received by Mississippi farmers for corn, oats, wheat, and soybeans derived from 13-month moving averages, 1947-54.

	Months											
Crop	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Corn	96.2	98.4	100.3	102.5	104.3	105.1	106.8	105.8	102.9	95.9	90.5	91.1
Oats	104.0	101.0	101.5	104.7	102.7	90.3	89.2	93.7	98.5	103.9	106.5	103.9
Wheat	104.6	102.8	103.9	104.0	103.4	97.9	93.9	93.5	95.8	98.0	99.6	102.6
Soybeans	98.4	100.2	106.8	111.2	111.5	108.1	105.4	99.1	89.2	86.4	89.7	93.7

Source: **Agricultural Prices**, Agricultural Marketing Service (Bureau of Agricultural Economics through October, 1953), Washington, D. C., **February, 1947, to January, 1955.**

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BULLETIN 539 OCTOBER, 1955

Practices and Charges Of Selected Credit Agencies Making Loans To Mississippi Farmers, 1953

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

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Practices and Charges of Selected Credit Agencies Making Loans to Mississippi Farmers, 1953

By

E. E. KERN, JR.[1]

INTRODUCTION

"Availability" and "dependability" are key words in describing the kind of credit desired and needed by farmers engaged in commercial agricultural production and marketing. Daniel Webster has written that, "Credit has done a thousand times more to enrich mankind than all the gold mines in the world. It has exalted labor, stimulated manufacture and pushed commerce over the sea." Its importance in agriculture is no less great than in other areas of the economy. It has to be considered before capital goods on the farm are expanded or before deciding production practices and procedures to follow. Indeed, it has a direct bearing on the standard of living of the farmer, his family and his community.

With the extending and using of credit comes responsibility. Lack of understanding, improper extension and use or other improprieties may cause severe hardship on borrowers, lenders and consequently on society. Flexibility in policies and practices of lenders in meeting the varying adjustment needs of farmers arising from many sources is of primary importance.

SYNOPSIS OF THE CREDIT PROBLEM

Good credit, in order to be of most service to all, should have as many of the following characteristics as posible:[2]

1. ". . . must help the borrower as much as or more than the lender.
2. ". . . must be credit which will liquidate itself from earnings and not from the sale of collateral.
3. ". . . must be credit which is adjusted in point of time for repayment to that period when income is received.
4. ". . . must be credit which takes into consideration the ability of management to utilize it as a necessary and useful tool of its business or profession."

The problem in agriculture is to determine how well the credit systems recognize these cardinal factors in their regular business activities.

In order to determine the availability of credit, many factors must be considered. In speaking of the demand for a specific agricultural commodity such as cotton, for example, it would mean little to assert that the domestic demand is nine million bales without pointing out precisely the conditions under which this demand exists, including a schedule of prices. Likewise, in analyzing the availability of credit, one should investigate the following:

1. Available to whom—owners, part-owners, tenants, croppers?
2. Credit limits—of the system, for individual borrowers, imposed limits set by the lending agency?
3. Cost or effective rates of interest?
4. Security requirements?
5. Purposes for which funds may be borrowed?
6. Time for which funds may be borrowed?
7. Repayment schedules, supervisions, etc.?

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[1] Formerly Assistant Economist, Mississippi Agricultural Experiment Station.

[2] Leland, R. M., President, Northborough National Bank, Northborough, Massachusetts, "The New England Farm Finance News," Federal Reserve Bank of Boston, Vol. 8, No. 7, July, 1953.

Making a sound loan from the standpoint of both borrower and lender is no simple task; nonetheless, it is an important one. The risk of the transaction may or may not be balanced for both parties. For example, the principal amount of the loan may be safe to the lender but quite hazardous to the borrower who expects to repay the principal plus interest out of income earned from the use of funds. On the other hand, the lender assumes risks with respect to the borrower's reputation and his financial situation. In addition, external factors, primarily cyclical fluctuations, add uncertainty to the transaction.

The difficulty of making adequate predictions as to prices and incomes is illustrated in the following example. In July 1952, Mississippi farmers received an average of $21.20 per cwt. for beef cattle.[3] During the same month a year later, the price had dropped to $10.20,[4] or a decrease of 52 percent. Lenders and borrowers, believing that their cattle loans were from 40 to 50 percent of the liquidating security, suddenly found themselves with 100 percent loans. Situations of this kind may cause workouts, refinancing, or selling the security at low prices. All of these situations exert undue pressures on the borrower and on the lender. Excessive loans may mean frozen assets to lenders as was experienced in the early thirties throughout the nation.

OBJECTIVES

This report relates to the short-term lending activities of certain commercial banks and Production Credit Associations in Mississippi. Its specific objectives are as follows:

1. To present and analyze farm credit data relative to the operating activities of certain short-term lenders.

2. To examine the policies and practices of selected agencies in an attempt to understand more fully the "dependability" and the "availability" of short-term and intermediate credit in Mississippi.

3. To make certain comparisons among the competing institutions in regard to policies and practices in dealing with farmers.

PROCEDURE

Personal interviews were made throughout the State in 1953 with 30 bankers and with the secretary-treasurers of nine Production Credit Associations. Information was obtained concerning their credit practices and procedures in dealing with farmers in Mississippi. Five bankers were located in the Delta area, 16 in the East and Central area, and nine in the Southern area of the State.

Assistance and/or statistical data were gotten from the Farm Credit Administration, American Bankers Association, Mississippi Bankers Association, State Banking Department, and the United States Department of Agriculture.

TRENDS IN ASSETS AND LENDING OPERATIONS

Generally, non-real-estate loans include borrowing for those activities which are planned from a few weeks to approximately three years in advance. Commercial banks, Production Credit Associations, and the Farmer's Home Administration are the major short-term lenders to farmers in Mississippi, (Appendix Table 1). The FHA lends primarily to those farmers who do not qualify for credit through some other agency. In addition to the above, the Commodity Credit Corporation makes loans to particular farmers through authorized agents, and guarantees certain other loans held by regular credit agencies. Also, the Staple Discount Corporation is an important lender in the Mississippi Delta. Banks and PCA's make the bulk of the regular short-term loans to farmers on a statewide basis.

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[3] **Agricultural Prices,** Bureau of Agricultural Economics, United States Department of Agriculture, July, 1952.

[4] **Agricultural Prices,** Bureau of Agricultural Economics, United States Department of Agriculture, July, 1953.

Banks

Mississippi banks in general are farmers' banks; i.e., they are located mostly in small rural communities, do a substantial amount of farmer business, and hold a sizeable amount of farm deposits in relation to the total. Only one bank in the State failed to hold some type of farm loan at the beginning of 1955.

Banks generally limit their operations to a given county, although offices and/or branches enable some of them to cover a wider area.[5] Convenience, better knowledge of borrowers and availability of county records were the primary reasons given for limiting operations to one county. The average number of banks per county varies from none to eight, usually there is only one or two, Figure 1.

Condition of Banks. Banks depend primarily on deposits as their main source of loan funds. In recent years demand deposits have become increasingly important. This survey revealed that some Mississippi banks handled no time deposits in 1953. Of the $903 million in deposits held by banks throughout the State at the beginning of the year, 85 percent were callable on demand. Variations in bank deposits in this area from 1923 are shown in Figure 2.

Banks in this State were in a favorable position with respect to liquidity, Table 1. At the beginning of 1954, 54.6 percent of all assets were in the form of cash or United States Government securities. This was 2 percent less than was reported the preceding year. This favorable position would enable banks, if necessary in the event of shrinking deposits, to refrain from calling loans in order to maintain adequate reserve positions. Further, it indicated that if credit were demanded by borrowers, and if bank policies permitted additional credit extension, the potential capacity would be available. Loans and discounts of all kinds represented about 31 percent of all bank assets at the beginning of 1954. This was 3 percent more than was reported the previous year. Total bank assets increased slightly in 1954 over 1953.

Bank Lending. Although banks are not entirely free in the kind of loans they may make, they do serve a wide variety of applicants, Table 2. The job of the commercial banker is to supply the legitimate credit needs of his community.

Although no specific regulations exist concerning the proportion of loans which may be for agricultural purposes, one banking official indicated that up to 35 percent was not considered excessive from the point of view

Table 1. Percentage distribution of total assets of Mississippi banks, December 31, 1953.

Kind of asset	Total	National banks	State banks: Member F. R. Sys.	State banks: Not member F. R. Sys.
Cash and balances with other banks	26.1	29.3	27.9	24.3
United States Government obligations, direct and guaranteed	28.5	28.8	22.9	29.3
Other securities	13.9	12.0	11.6	15.2
Loans and discounts	30.5	28.9	36.1	30.3
Other assets	1.0	1.0	1.5	.9
Total	100.0	100.0	100.0	100.0
Number of banks	197	25	7	165

Total assets of all banks in Mississippi, December 31, 1953 — $1,014,032,000.

Source: Report No. 40, "Assets, Liabilities, and Capital Accounts, Capital and Other Ratios, Commercial and Mutual Savings Banks, December 31, 1953." Federal Deposit Insurance Corporation, Washington 25, D. C.

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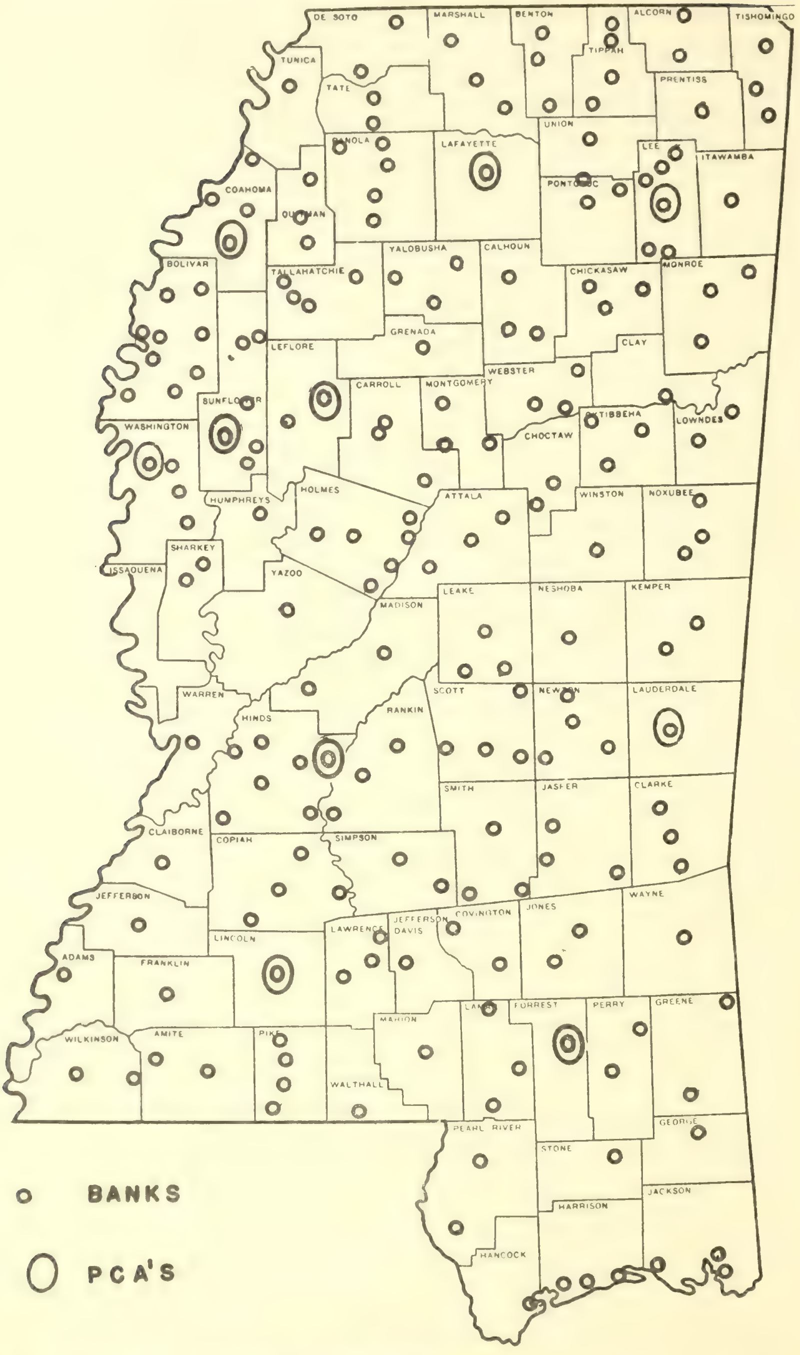
[5] A bank may establish branch offices within the corporate limits of the city where it is domiciled when the population is not less than 10,000, and within the limits of the county within which such bank is domiciled; provided, the city is not less than 3,500 population and where there are not already one or more banks or branches in operation. The branch office may only take applications for loans . . . (Code, 1942, Sec. 5228, **Handbook of Banking Laws,** compiled by J. T. Brown, counsel for Mississippi Bankers Association, Section 74.)

Branch banks may be established within a radius of one hundred miles of the parent bank provided that no parent bank shall be permitted to establish more than 15 branch banks; also, no parent bank shall be permitted to establish a branch bank in any town or city of less than 3,100 population . . . (Code, 1942, Sec. 5229, **Handbook of Banking Laws,** compiled by J. T. Brown, counsel for Mississippi Bankers Association, Section 75.)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COAHOMA
PONTOTOC
QUITMAN
BOLIVAR
YALOBUSHA
CALHOUN
CHICKASAW
MONROE
TALLAHATCHIE
GRENADA
CLAY
LEFLORE
WEBSTER
CARROLL
MONTGOMERY
SUNFLOWER
OKTIBBEHA
LOWNDES
WASHINGTON
CHOCTAW
HUMPHREYS
HOLMES
ATTALA
WINSTON
NOXUBEE
SHARKEY
ISSAQUENA
YAZOO
MADISON
LEAKE
NESHOBA
KEMPER
WARREN
SCOTT
NEWTON
LAUDERDALE
HINDS
RANKIN
SMITH
JASPER
CLARKE
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COPIAH
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JEFFERSON
WAYNE
JONES
COVINGTON
JEFFERSON DAVIS
LAWRENCE
LINCOLN
ADAMS
FRANKLIN
LAMAR
FORREST
PERRY
GREENE
MARION
WILKINSON
AMITE
PIKE
WALTHALL
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK
BANKS
PCA'S

Figure 1. Location of Production Credit Associations and Commercial Banks in Mississippi, 1954.

of bank examinations. In general, diversification of loans is encouraged.

As indicated in Table 2, agricultural loans represented 23 percent of all loans and discounts of insured commercial banks in Mississippi in 1953. The largest segment of the total was made up of commercial and industrial loans. These represented loans made to established firms which kept check-

Table 2. Bank loans outstanding by types, Mississippi, December 31, 1952.

Type	Amount 1,000 dollars		Percent of total	
Commercial and industrial		$ 96,224		34.2
Total agricultural		64,825		23.0
Farm loans guaranteed by CCC	$ 3,103		1.1	
Other loans to farmers	44,236		15.7	
Real estate farm loans	17,486		6.2	
For carrying securities		9,642		3.4
Residential real estate loans		42,324		15.0
Other loans to individuals		62,259		22.1
Other		6,617		2.3
Total loans and discounts		$281,891		100.0

Source: Report No. 38, "Assets, Liabilities, and Capital Accounts, Capital and Other Ratios, Commercial and Mutual Savings Banks, December 31, 1952," Federal Deposits Insurance Corporation, Washington, D. C.

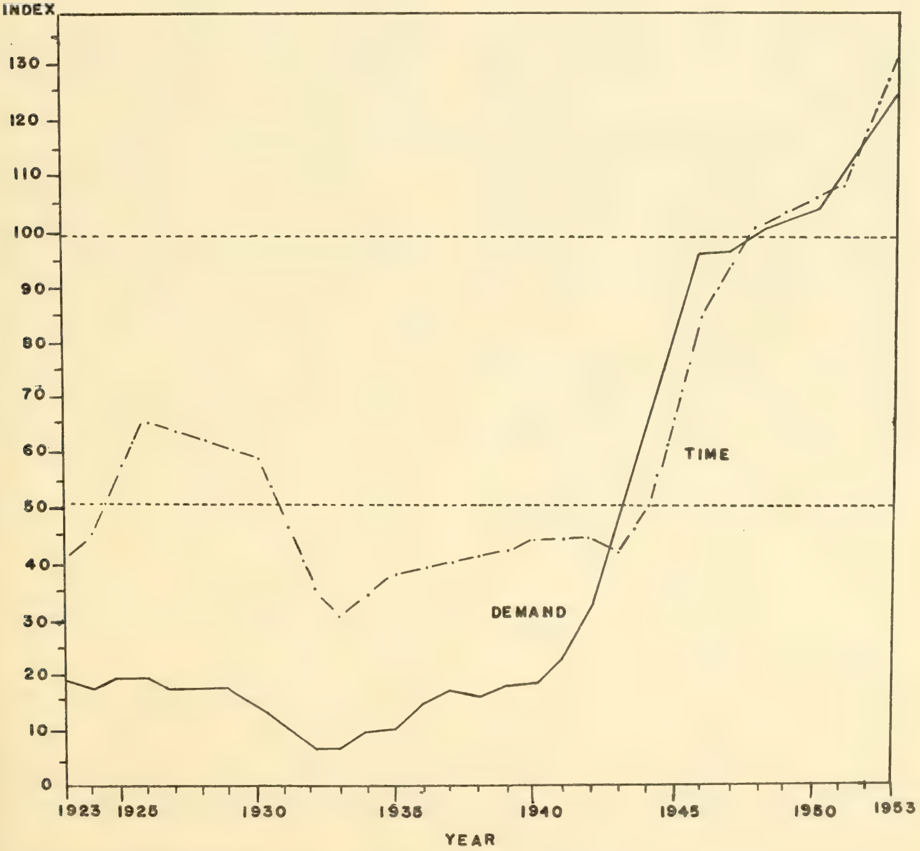

Figure 2. Demand and time deposits of country banks, Mississippi, Arkansas, and Louisiana, 1923-52, 1947-49 = 100.

Source: See Appendix Table 3.

ing accounts with the banks, and a large portion were unsecured. Dealers extending credit for certain items of farm equipment were included.

Some other borrower categories, in order of importance, were: agricultural loans, other loans to individuals, and residential real estate loans. Other loans to individuals included installment paper for automobiles, etc. This category ranked in importance with agricultural loans.

The farm loan volume of commercial banks has been consistently greater than for any other credit agency in Mississippi, as elsewhere. An analysis of the component parts of all loans to farmers by insured commercial banks in Mississippi for the past eight years is shown in Table 3. During the period, 1948-55, wide fluctuations have occurred in the non-real-estate loan volume of banks depending primarily on the volume of guaranteed CCC loans held. The year 1954 represented the high point in the years shown for CCC loans held by banks. Fifty-five percent of all insured banks held about $59 million in CCC loans as of Janaury 1, 1954. The amount held has fluctuated according to the activity of the government's program for farm price support.

Non-real-estate loans, excluding CCC loans, have shown eratic fluctuations between 1948 and 1955. After fluctuating upward from about $15 million in 1948 to $44 million in 1953, substantial drops occurred in 1954 and 1955. In 1953 the increase was 82 percent over the previous year, and in 1954 the total dropped by 49 percent over 1953. The loan volume was about 4 percent higher in 1955 than in 1954. A high concentration of non-real-estate loans appeared in the Delta, Figure 3. Short-term loans on cotton warehouse receipts may have accounted for this concentration. Borrowings for the new crop year reportedly are obtained in February and March.

Production Credit Associations

The System. The Production Credit System was established in 1933 apart from the existing banking system This independent system was designed to meet the particular short-term and intermediate credit needs of agriculture. In summary, its primary purpose was to make credit available to farmers throughout the nation:[6]

1. "On a permanent basis

2. From money derived from private investors

3. In a form adapted to the peculiar needs of agriculture

4. At the lowest cost consistent with sound business principles

5. On notes signed by individual farmers and endorsed by local farmers' cooperative credit associations which were designed ultimately to be completely farmer owned and farmer controlled."

Mississippi Associations.[7] The ten Production Credit Associations in Mississippi in 1953 with their field offices were able to furnish farm credit in every county in the State, Table 4.

Loans discounted by the FICB for associations in Mississippi during 1953 were as follows:

Table 3. Loans to farmers by all insured commercial banks, as of January 1, Mississippi.

Loan classification	1948	1949	1950	1951	1952	1953	1954	1955
	Thousand dollars							
Loans to farmers guaranteed by CCC	$ 574	$23,445	$10,577	$ 107	$ 3,035	$ 3,103	$58,626	$32,168
Other non-real-estate loans to farmers	15,087	18,462	18,528	21,794	24,292	44,236	22,744	23,567
Total non-real-estate loans to farmers	15,661	41,907	29,105	21,901	27,327	47,339	81,370	55,735
Real estate farm loans	11,669	11,610	13,467	14,450	15,666	17,486	17,473	19,984
Total agricultural loans	27,330	53,517	42,474	36,351	42,993	64,825	98,843	75,719

Compiled from data of the F. D. I. C. as reported in "Agricultural Credit and Related Data," American Bankers Association, 1948-55.

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[6] Farm Credit Administration, First Annual Report, 1933, p. 36. As reported by Butz, E. W., **The Production System for Farmers,** 1944, p. 5.

[7] For a discussion of the organizational arrangement of Production Credit Associations in Mississippi, see: Jenkins, L. P., **Production Credit Association In Mississippi,** Bulletin No. 513.

KIND OF LOAN	Amount loaned, millions	Percent of total
Crop production	$31	67
Livestock and dairy program	12	26
Poultry, truck and tung oil products	3	7
TOTAL	$46	100

This represented a 7 percent decrease in total loans over the preceding year, Table 5. Disbursements increased steadily from the first year of operations throughout the period of steadily rising prices. The greatest amount of growth has been shown in more recent years. Income opportunities have been conducive to the expansion of credit.

The number of loans granted per year has not gone up as fast as the dollar volume. This is in keeping with the fact that farms have been becoming fewer in number and larger in size, requiring larger expenditures. The greatest percentage increase in the amount loaned came during the second year of operations, while the greatest total number of loans was made in 1949.

Comparison: Banks and PCA's. For the six-year period, 1946-51, Mississippi banks made about three times the number of loans, on the average, as did PCA's. During the same period, bank loans made were approximately half the size of those extended by PCA's. The average annual volume of bank loans was about 1.7 to 1 over PCA s during the period, Table 6.

The ratio of bank loan volume to that of the PCA's, as of January 1, decreased from almost 5:1 in 1944 to a little above 2:1 in 1946. For the past five years bank volume has been just above 2:1 that of PCA's, Figure 4 and Table 7.

Table 4. Production Credit Association, counties served, and full time employees, 1953.

Location	Number of counties served	Number of field offices	Number of employees
Brookhaven	9	3	8
Clarksdale*	4	2	8
Greenville*	4	2	8
Greenwood	6	6	8
Hattiesburg	15	5	15
Indianola	2	1	6
Jackson	9	6	15
Meridian	11	9	19
Oxford	10	10	20
Tupelo	13	7	17
Totals	82	54	124

Source: Annual Report, United States Department of Agriculture, F. C. A., 1953; and from a letter from the PCA in New Orleans giving the number of field offices.
*Each of these offices serves a part of Bolivar county.

Table 5. Number of loans made and amount loaned by PCA's, Mississippi, 1934-54.

Date	Amount loaned, (000) dollars	Percent change in amount loaned	Number of loans made	Percent change in number of loans
1934	3,131	—	5,594	—
1935	5,248	+67.6	9,954	+77.9
1936	6,157	+17.3	11,373	+14.3
1937	8,165	+32.6	12,973	+14.1
1938	8,098	— 8.2	13,725	+ 5.8
1939	8,357	+ 3.2	12,428	— 9.4
1940	8,979	+ 7.4	12,005	— 3.4
1941	10,452	+16.4	11,743	— 2.2
1942	13,121	+25.5	13,445	+14.5
1943	14,794	+12.7	15,532	+15.5
1944	15,800	+ 6.8	14,048	— 9.6
1945	17,251	+ 9.2	14,573	+ 3.7
1946	20,761	+20.3	15,701	+ 7.7
1947	23,597	+13.7	16,125	+ 2.7
1948	31,223	+32.3	15,574	— 3.4
1949	33,929	+ 8.7	16,626	+ 6.8
1950	33,518	— 1.2	15,257	— 8.2
1951	42,757	+27.6	15,013	— 1.6
1952	49,698	+16.2	15,058	+ .3
1953	45,891	— 7.7	13,693	— 9.1
1954	45,772	— 0.3	14,930	+ 9.0

Source: Summary of operations, Production Credit Associations, F. C. A.

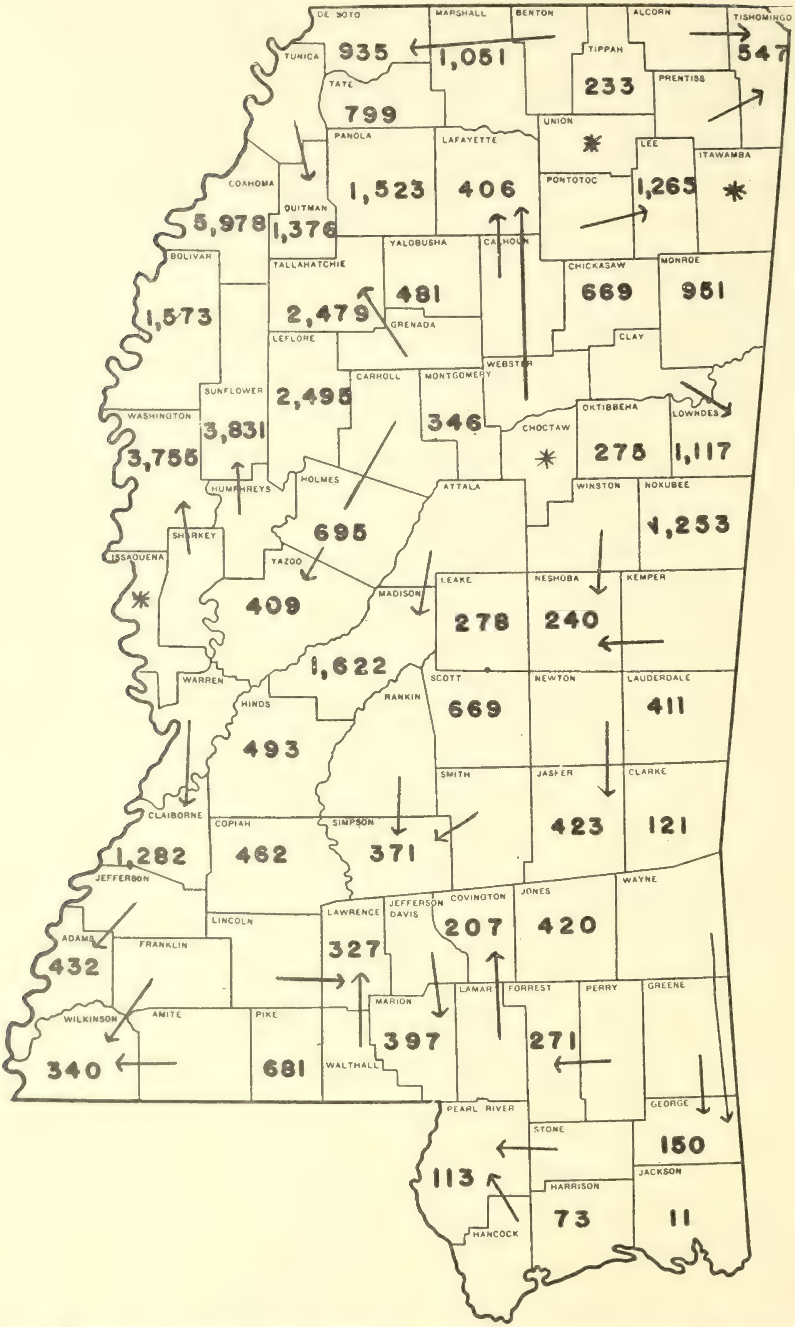
DE SOTO
935
MARSHALL
1,051
BENTON
ALCORN
TISHOMINGO
547
TUNICA
TIPPAH
233
PRENTISS
TATE
799
UNION
*
PANOLA
1,523
LAFAYETTE
406
LEE
1,265
ITAWAMBA
*
COAHOMA
5,978
QUITMAN
1,376
PONTOTOC
YALOBUSHA
481
CALHOUN
CHICKASAW
669
MONROE
951
BOLIVAR
1,573
TALLAHATCHIE
2,479
GRENADA
CLAY
LEFLORE
2,495
CARROLL
MONTGOMERY
346
WEBSTER
SUNFLOWER
3,831
WASHINGTON
3,755
CHOCTAW
*
OKTIBBEHA
275
LOWNDES
1,117
HUMPHREYS
HOLMES
695
ATTALA
WINSTON
NOXUBEE
1,253
SHARKEY
ISSAQUENA
*
YAZOO
409
MADISON
LEAKE
278
NESHOBA
240
KEMPER
1,622
WARREN
HINDS
493
RANKIN
SCOTT
669
NEWTON
LAUDERDALE
411
SMITH
JASPER
423
CLARKE
121
CLAIBORNE
1,282
COPIAH
462
SIMPSON
371
JEFFERSON
LINCOLN
LAWRENCE
327
JEFFERSON DAVIS
COVINGTON
207
JONES
420
WAYNE
ADAMS
432
FRANKLIN
WILKINSON
340
AMITE
PIKE
681
WALTHALL
MARION
397
LAMAR
FORREST
271
PERRY
GREENE
PEARL RIVER
113
STONE
GEORGE
150
HARRISON
73
JACKSON
11
HANCOCK

Figure 3. "Other Agricultural Loans" held by insured commercial banks, Mississippi, December 31, 1952.

Note: These data were classified by counties according to location of bank. Data for any county wtih less than three banks are not shown separately, but included with data from surrounding counties.

*No insured commercial banks in county.

Compiled from F. D. I. C. data (rounded).

The ratio of bank volume to PCA volume on July 1 has been consistantly below that for January 1. This indicates that PCA's have liquidated most of their loans by the first of the year whereas banks have not. As of July 1, for 1950-53, the ratio of bank loan volume to that of the PCA's remained at 1.3:1.

POLICIES AND PRACTICES

Credit agencies are guided both by internal and external factors in setting up lending procedures. Interpretation of policy, knowledge of the situation, and conditions of the moment all play a part.

While it is generally true that individuals with a large net worth have no difficulty in obtaining credit, problems arise on certain marginal cases, i.e., when is a man considered marginal and how well is this determined? Some difficulties arise in supplying sound credit to those who rent or work on shares. The line of demarcation between "manager" and "laborer" is not easy to discern. Consequently, variations were noted in the handling of these cases. The manner in which land is operated in Mississippi since 1940 is shown in Table 8. The number of tenants of all kinds has decreased from about 66 percent in 1940 to 52 percent in 1950. Most of those considered for loans would likely come in the first three groups. Croppers, the largest group, furnish little more than labor and share almost none of the managerial responsibilities.

Lending

Banks. With certain noted exceptions, national banks may not lend an individual more than 10 percent of their capital and surplus.[8] Warehouse receipts and government bonds used as security present exceptions, as this relates to the farm. State banks may lend up to 15 percent of their capital

Table 6. Non-real-estate loans made by banks and PCA's to Mississippi farmers, 1946-54.

	By banks*				By PCA's			
Date	Number of loans made	Percent of farmers served	Amount loaned (000)	Average size of loan	Number of loans made	Percent of farmers served	Amount loaned (000)	Average size of loan
1946	46,571	17.7	$42,884	$ 921	15,701	6.0	$20,761	$1,322
1947	37,781	14.3	36,796	974	16,125	6.1	23,598	1,463
1948	55,850	21.2	58,232	1,043	15,574	5.9	31,223	2,005
1949	43,552	16.5	40,506	930	16,626	6.3	33,929	2,041
1950	50,602	20.1	66,246	1,309	15,257	6.1	33,518	2,197
1951	43,662	17.4	63,506	1,454	15,013	6.0	42,757	2,848
1952	—	—	—	—	15,058	6.0	49,698	3,300
1953	—	—	—	—	13,693	5.4	45,891	3,351
1954	—	—	—	—	14,930	5.9	45,772	3,066

Source: Semi-annual reports of the Farm Credit Administration and F. D. I. C. as reported in "Agricultural Credit and Related Data," American Bankers Association, 1948-1955.
*Bank loans and number of bank-borrowing farmers estimated by Agricultural Commission, ABA, on the basis of sample questionnaires. Comparable data not reported after 1951.

Table 7. Bank non-real-estate farm loans and PCA loans outstanding, Mississippi, 1950-1955.

	PCA'S		Banks	
Date	Amount loaned dollars (000)	Percent change	Amount loaned dollars (000)	Percent change
	As of January 1			
1950	18,675	—	8,943	—
1951	21,981	+17.7	8,071	— 9.8
1952	24,542	+11.7	11,295	+39.9
1953	44,236	+80.2	16,191	+43.3
1954	22,637	—48.8	11,695	—27.8
1955	23,567	+ 4.1	12,336	+ 5.5
	As of July 1		As of June 30	
1950	30,753	—	23,126	—
1951	35,705	+16.1	28,440	+23.0
1952	44,374	+24.3	33,991	+19.5
1953	45,607	+ 2.8	35,303	+ 3.8

Source: Reports of the Agricultural Commission, ABA, and Annual Reports of the Farm Credit Administration.

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[8] Brown, **Op. Cit.**, Section 19, Limit of Liability of Any One Borrower.

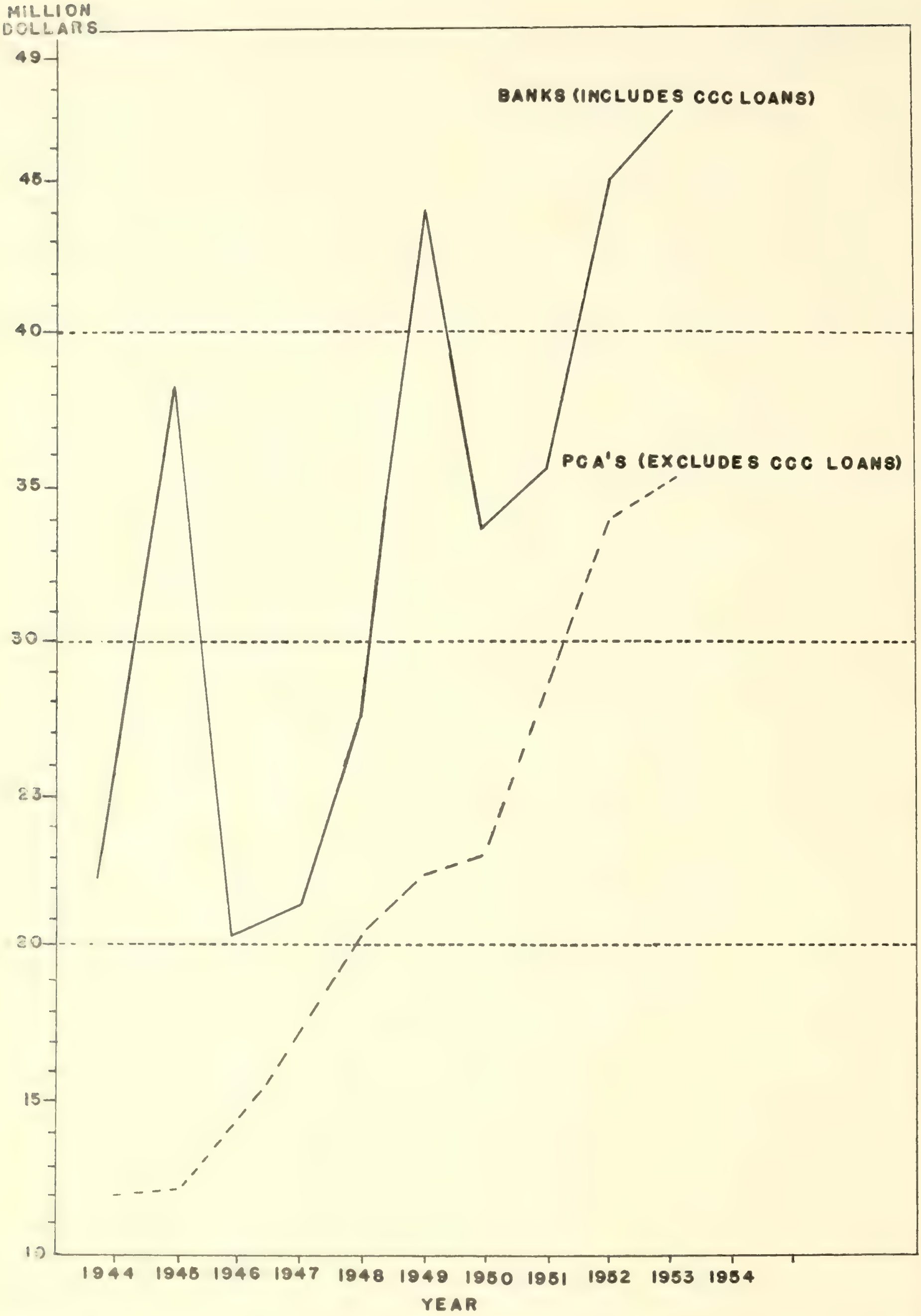

Figure 4. Non-real-estate loans to Mississippi farmers: Amounts held by banks and PCA's, as of July 1, 1944-1953.
Source: See Appendix Table 1.

and surplus to individual borrowers.

While bankers operate within a somewhat fixed institutional and legal framework, the phrases often repeated were: "We are very selective . . . set our own limits." Size and purpose of the loan appeared to be the main factors in determining the practical lending limits. Bankers visited in the Delta were of one accord in not wishing to expand credit further for crop production, especially large cotton or other crop loans. The high degree of risk which may be found in a crop area is indicated by this cautious attitude. One banker indicated that a farmer had to furnish himself with credit until the crop was up, then the bank would take him on through. The policy of banks was to furnish a man his production credit needs once they decided to take him on as a customer. This helps explain their rather inclusive policy in requiring security. Most bankers did not have a precise lending limit on total agricultural loans. It was common practice for them to observe closely the relation of deposits to total loan balance, which varied from 25 to 40 percent.

A summary of the answers given by bankers from different sections of the State relating to lending practices are given below. "Selectivity," "financial statements" and "endorsements" stand out in the answers.

East and Central:

1. "An endorsement is required only when part of the crop is owed to the landlord."
2. "We lend only to owners, no tenants. We want no crop loans."
3. "We are very lenient. We never ask for a waiver and only occasionally for an endorsement."
4. "We place no limit on production loans; only on real estate."
5. "We want only the very best risks. We give less credit than any other bank in town."
6. "We are very selective in our agricultural loans. A man must have personal property. In addition, if he is a renter, we want a waiver and an endorsement."
7. "A man must have security to cover the loan. We don't want a rent waiver."
8. "We are very lenient with farmers. However, we do not want crop loans. We feel that PCA's offer a better service here."
9. "We want only the very best risks. We are in business to make money."

South:

1. "We set our own limits on farm loans. A one-fourth tenant must have a rent waiver. A one-half tenant must furnish an endorsement, and the bank takes first lien on the crop."

Table 8. Number and percent of tenants of different kinds*, Mississippi, 1940, 1945, 1950.

Kind of tenancy	1950 April 1		1945 Jan. 1		1940 April 1	
	Number	Percent	Number	Percent	Number	Percent
Cash tenants	11,200	8.6	17,344	11.1	18,978	9.8
Share-cash tenants	1,543	1.2	1,361	.9	1,839	1.0
Share tenants	34,868	26.9	28,623	18.3	34,119	17.7
Croppers	74,617	57.5	97,074	62.1	125,483	65.1
Other unspecified	7,593	5.8	11,853	7.6	12,400	6.4
Total	129,821	100.0	156,255	100.0	192,819	100.0
All operators	251,383		263,528		291,092	

Source: **1950 Census of Agriculture**, United States Department of Commerce, Bureau of the Census.

*"Tenants—rent from others or work on shares for others all the land they operate.

Cash tenants—pay cash as rent (certain price per acre or per farm).

Share-cash tenants—pay a part of the rent in cash and a part as a share of the crop or of the livestock or livestock products.

Share tenants—pay a share of either the crops or livestock or livestock products, or a share of both.

Crop-share tenants—pay only a share of the crops.

Livestock-share tenants—pay a share of the livestock or livestock products. They may or may not also pay a share of the crops.

Croppers—crop-share tenants whose landlords furnish all the work power. The landlords either furnish all the work animals or furnish tractor power in lieu of work animals. Croppers usually work under the close supervision of the landowners or their agents and the land assigned them is often merely a part of a larger enterprise operated as a single unit."

2. "We set our own limits on agricultural loans. In the case of tenants, we would finance the landlord."

3. "We are especially careful about real estate loans. We never want our total loans over 25 percent of our deposits. In the case of the tenant, we would rather deal with the landlord. We want to be extremely conservative in order that we might go along with customers if times become depressed."

4. "Security is the important thing with us. We never take a crop alone."

5. "We have no particular policy regarding lending limits. If the man is a tenant, we require a waiver."

6. "We are very selective. We want no two-cow and one-mule kind. We turn down about three out of ten farmers who request credit. We don't have to turn down some. They just don't bother to come in."

7. "We can be very selective. There is no shortage of loans available."

8. "We are very selective."

9. "Our farm loans are minor. Security is our primary consideration."

Delta:

1. "Cannot handle large farm loans."

2. "Want strong financial statement."

3. "If renter, waiver required in addition to security."

Production Credit Association. Production Credit Associations depend on the Federal Intermediate Credit Bank as their primary source of loan funds All applications for loans are made through local associations. Loans are then made if approved by the local loan committies. Approved loans are then submitted to the FICB in New Orleans for discount or purchase. Local associations replenish their loan funds in this manner. Thus, their lending policies are necessarily guided by the ability of the FICB to obtain funds by the sale of their bonds to private investors.

PCA's may legally lend up to ten times their net worth. Net worth includes "A" and "B" stock in addition to accumulated reserves. On this basis in 1952, Mississippi associations could have extended ten times $6.4 million, or $64 million. The maximum outstanding loan balance during the five-year period ending December, 1952, was $37 million. The ratio of loans to net worth, considering all associations, has been about 6 to 1.

Several important factors have to be taken into account in extending credit to each association. Some of these are as follows: competency of the management of the association, amount of unimpaired capital and surplus, the amount of general collateral pledged with the bank and the quality of loans offered to the bank.

Production Credit Association managers indicated generally that they were close to their lending limits in terms of their present capital structures and policies of the Federal Intermediate Credit Bank. One individual stated that his loan-capital ratio was near 7 to 1 and that he expected to drop a number of marginal borrowers the following year on this account. Another stated that 6 to 1 was as high as his local association wished to lend. At the beginning of 1953, the ratio of net worth to the maximum loans outstanding the preceding five years varied from an average of 6.3 to 1 for the Delta associations where a substantial number of large loans were made, to 5.3 to 1 in the six other associations.

The following limitations were placed on the maximum amount to be loaned to a single individual, except with the expressed permission of the Commissioner of the Federal Intermediate Credit Bank:

(1) "Twenty percent of the paid-in and unimpaired capital and surplus of the financing institution, in the case of crop and general agricultural paper; or

(2) 50 percent of the paid-in or unimpaired capital and surplus of such institution, if the notes or other obligations are adequately secured by warehouse receipts representing readily marketable and nonperishable staple agricultural commodities, or by chattel mortgage on livestock; and shall be subject to such further limitations as may be imposed by the laws governing the

> operations of the financing institution concerned."[9]

Another requirement of Production Credit Associations has been that they lend only to farmers, "including individuals or partnerships owning agricultural land or engaged in the business of breeding, raising, or fattening livestock; and also includes corporations engaged in these activities".[10] At least half of a corporation's gross income must come from agricultural sources in order to qualify for a loan, and half of the time of its active officers and personnel must be spent in the conduct of these activities.

Production Credit Associations may lend only to those who share in the function of management, i.e., making decisions and sharing the accompanying responsibilities.[11] It has been indicated that a liberal interpretation of the "rule" is followed in practice.[12]

> "In a cash rental operation or a fixed share rent, such as one-third of the crop, the tenant is considered the farmer and the loan is made to him. Generally in either a cash rental or a fixed share of the crop, the tenant ordinarily owns the farming equipment, furnishes everything, and is the manager of the operations.
>
> "In a share cropper operation where the landlord owns the equipment and generally furnishes everything, except the labor and part of the cost of fertilizer, seed, and ginning, the landlord is considered the farmer and the loan would be made to him.
>
> "There are some cases, usually in connection with larger farms, where there are some of each kind of the relationships as above stated; that is, some will work on a share crop basis (50/50), and some part of the crop may be worked by day laborers or labor employed by the week or month. The person handling the entire operation (generally the landowner) is considered the farmer, and the loan would be made to him. In determining the amount of loan and in arriving at the liquidation expected from the farming operation, only the interest of the farmer to whom the loan is made will be considered. The interest includes the farmer's share of the crop (sometimes the cash rent which is paid), plus any amount which any of the tenants will owe to the landlord in connection with the crop, payment of which is secured to the landlord by a lien on the tenant's crop.
>
> "When a loan of this kind is made, the farmer borrower has the control and supervision over all farming operations considered."[13]

Some of the comments of local PCA managers regarding lending were as follows:

1. "We can lend to any eligible borrower. We can go along with a small

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[9] 1949 Edition Code of Federal Regulations, Title 6, Agricultural Credit, Part 43, p. 70.

[10] **Ibid.**

[11] **Ibid.** The following statement is taken from the Code of Federal Regulations: "An applicant for a loan, the proceeds of which are to be used for farming or livestock operations conducted through tenants or share croppers, will be ineligible unless it affirmatively appears that he has a right to and does actually exercise the substantial discretion and control in the management of the enterprise. When a landlord is entitled only to a fixed return without regard to the success or failure of the farming operations, the tenant, not the landlord, is to be considered the farmer."

[12] By letter from the Production Credit Corporation.

[13] Brown, **Op. Cit.**

Section 1. **Goods not to be removed until rent paid,** Code, 1942, Sec. 36.

Section 5. **Lien of landlord.** Every lessor of land shall have a lien on the agricultural products of the leased premises, however and by whomsoever produced, to secure the payment of the rent and of money advanced to the tenant, and the fair market value of all advances made by him to his tenant for supplies for the tenant and others for whom he may contract, and for his business carried on upon the leased premises; and this lien shall be paramount to all other liens, claims, or demands upon such products . . . Code, 1942, Sec. 908.

Section 6. **Lien for Livestock, Implements.** A landlord shall have for one year, a lien for the reasonable value of all livestock, farming tools, implements and vehicles furnished by him to his tenant, upon the property so furnished and, as an additional security therefor, upon all the agricultural products raised upon the leased premises . . . Such lien shall be a superior and first lien, and need not be evidenced by writing, or if in writing need not be recorded. Code, 1942, Sec. 909.

renter. However, a large renter needs to own land to fall back on in case he can't get the rented land for another year. We ask for a waiver."

2. "Won't take a large cash renter, landlords won't waive rents in a carryover."

3. "Turn down about one-half of applicants. Rent waiver not desirable. Share-renter better than cash. Make many small loans We are a service organization; consequently, we have high losses."

4. "Man must have adequate net worth and financial statements to get a loan."

5. "Would rather finance landlord."

6. "Want rent waiver."

7. "Must have security for a workout."

8. "Share-renter may borrow. Security and the ability to repay is important. One must have control of the crop."

As indicated, local managers vary in their ideas as to who may borrow. Some favored small renters; some were against taking a renter on the basis of a waiver; while another preferred share-renters to cash-renters. While they all generally agreed that theirs was a service organization, some placed more stress on the net worth and financial history of the borrower. Some associations, especially where many small loans were made, were inclined to stress the importance of the man and his ability to repay his loan. The "man," recognized by all as being of fundamental importance in determining the soundness of a loan, was felt to be better known by the local agents. It was reported that this fact sometimes caused loans to be rejected by the bank. However, it should be emphasized that facts concerning the man were contained in the inspector's report and in most cases the recommendations of the association with respect to the applicant were accepted by the bank.

Competition

Each cooperating lender was asked to comment on the amount of competition which he felt existed in his area with respect to obtaining the farm loan business. Before enumeratng their responses, it is well to give some competitive characteristics likely to be found in the short-term farm credit field.

Banks. Banks operate for profit as do any other privately-owned businesses. They can and do alter their policies among borrowers with varying degrees of risk and for other reasons deemed important by them. Their natural advantages as a result of position appeared to be: accessibility, absence of complicated procedures in making loans and in providing other banking services. Their primary concern for liquidity also affected their competitive position greatly in relation to other agencies. This factor continues to increase in importance as a larger percentage of deposits become demand deposits. Some commercial banks were found to have no facilities for time deposits by customers.

By far, the majority of bankers expressed little or no competitiveness in securing farm loans. Policies of banks within a given community varied widely in their desire to engage in farm lending. One banker indicated that he sent many farm borrowers seeking small loans across the street to his competitor because he knew their practice was to accommodate this type of individual whereas it was not the policy of his bank.

A Delta banker said, "I don't feel that banks can supply the kind of credit needed in this area. PCA's are in a better position to lend for farming purposes as they are specialists in this field." Other responses relating to this question in this area emphasized the advisability of having PCA's and the Discount Corporation supply the short-term production credit needs of farmers.

Banks and PCA's do compete more for the same type of loans in other areas of the state, although the same general feeling regarding competition prevailed. In a few banks where agricultural representatives were employed and where these men concentrated on getting farm loans, the thoroughness with which they canvassed the area was noted. However, only about 6 percent of all banks in the State have specialized farm agents. There are other banks which have certain individuals devote part of their time to farm credit. A few bankers indicated that they might set up a farm loan department at some future time. Others felt that the present arrangement was satisfactory.

Production Credit Associations. The Farm Credit System was established "to provide a well-rounded credit service for farmers and farmers' cooperatives, and to be a pace-setter in the credit field with respect to terms, interest rates and loan-servicing practices."[14] PCA's are not in a position to alter their competitive position among borrowers where unequal risks are involved. Also they are supposed to base the loan on the repayment possibilities of the farming enterprise. However, secretary-treasurers report that in practice, net worth and nonfarm income are not overlooked in granting a loan.

The response of the PCA lenders are given below:

1. "Don't solicit business. Would get marginal credit. Staple Cotton Discount Corporation is the only competition felt." (Staple Cotton Discount Corporation is a lending agency and part of the Staple Cotton Cooperative. It secures its funds from the FICB. It is important in the short-term credit field in the Delta.)

2. "Main competition is the Staple Cotton Discount Corporation. They secure funds from the FICB, too. Have made little headway in one certain area because banks have been rendering such good service."

3. "Little competition. Too much business for all."

4. "Banks charge too much. They are not set up to handle farm credit."

5. "Individuals and banks are very active in this area. We give service, keep rates down, make larger loans, and lend on the ability to repay out of earnings."

6. "Very little competition with banks (one exception cited). They take preferred risks."

7. "Fifteen banks in territory. Keen competition felt."

The above and other comments with noted exception, indicated that the "PCA's" did not feel much competition from other agencies at this time. Certain exceptions were noted. Whenever a banker was capable and wanted to be active in farm credit, his presence was felt and his position respected. However, at the time the interviews were made, the brisk demand for farm credit made PCA managers only admire the banker who was known in a community to be aggressive in the field of farm credit, even though some able borrowers were getting bank credit who could have otherwise received PCA credit.

PCA managers felt that they had a specialized service to offer and that trained personnel in this field were enabling them to carry out effectively their objectives within the limits of their physical resources.

New Adjustment Loans

The following statement relating to farm credit has been advanced as a basic principle:

> " . . . the lack of it (credit) should be allowed as little as possible to stand in the way of an undertaking or course of action that is otherwise good, and that ready access to funds should as rarely as possible lead to ventures that otherwise are not warranted."[15]

The different objectives of borrowers and of lenders may be stated as follows:[16] Lenders are interested in the safety of the principal amount, in a good rate of return, and in liquidity. Borrowers are interested in an adequate sized loan, in the adaption of credit to special need, to low cost of credit, and to the degree of risk created for the property involved as security for the loan.

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[14] Annual Report of the Farm Credit Administration, 1952-53, p. 1.

[15] Black, Clawson, Sayre, and Wilcox, **Farm Management**, Chapter XXXII, "Financing the Farm Business," p. 706.

[16] Ackerman, Joseph, "Capacity to Pay and Farm Financing," Illinois Bulletin No. 449, 1938.

There is risk and uncertainty surrounding any loan, both from the point of view of the lender and of the borrower. Both parties can be more adequately served by gaining adequate information as to capability, plans and prospects of the farmer, the farm business and the economy.

Lenders were asked to comment on the extent they were willing to finance "new adjustment" loans such as pasture improvement, poultry, forestry, etc. Some of the responses to this question are given below.

Banks.

1. "Want nothing but short-time loans."
2. "Tried broilers—not too successful—take land and house for security. Man must have pasture already to get cattle loan."
3. "Depend on customer rather than specific activity. Recommend native grasses rather than lend for improved pastures. Costs are too high otherwise."
4. "Take something else for security." "Finance dealers who in turn finance broiler producers." "Want no timber loans."
5. "All new adjustment loans including vegetable production are tied in with cotton. Too risky otherwise." (Bank in vegetable area.)
6. "Want no broiler loans. Let dealers take the risk."
7. "Time and risk important factors."
8. "Must be proven in area."
9. "Part of money goes here. Base loans on things with less risk."

The balance of the comments were in line with those given. Lending for those enterprises not fully established in a community were generally included in a general-purpose type of loan, thus eliminating the risk of the new venture for the lender. Bankers were not as inclined to question the purpose for which the loan was to be used as were PCA managers. Rather, they depended more on the man as a customer of the bank, his financial standing, and security, for protection. PCA's, on the other hand, were inclined to be more precise in determining how the loan was to be liquidated.

Production Credit Associations. The kinds of loans made based on the principle source of income received were as follows:

1. Commodity loans on stored commodities These may be made to permit orderly marketing and were generally made on warehouse receipts assigned to the association. Cotton was the principle crop concerned in Mississippi.
2. Crop loans involved the production of a cash crop aside from other farming operations. Price and production uncertainty in the production of cotton was considered less than on other cash crops.
3. Livestock loans. included range, pasture, feed lot, breeder, and hog operations. Feed lot operation was considered to be one of the safest types of loans where the loans were generally obtained for purchasing cattle to fatten in feed lots, or for the purchase of feed. Hog loans were considered hazardous and usually were included in the over-all operations.
4. Dairy loans were generally considered to be good loans. Certain hazards were felt in the specialized Grade A operation as opposed to the risk-spreading program of a small Grade C operator. Both incomes and expenses were generally higher in the former case.
5. Poultry loans were considered to be hazardous. Poor production and high mortality were principal causes for this. High expenses combined with these other two difficulties made good management imperative.
6. General purpose loans included operating funds for the entire business. Diversity reduced the risk of this type of loan. Likewise, the uncertainty of income would thus be reduced.

Some of the specific comments of PCA managers regarding their lending practices are listed below:

1. "Will not under-finance a man. Want to know a man's long-range plans.

He should have an adequate net worth and be able to demonstrate his ability to progress."

2 "Would include funds for pasture improvement in a crop loan."

3. "Liquidation possibilities must be there. Good man is enough security. Include in crop loan."

4. "Don't want poultry loans. Encourage pasture improvement. Have loans for cotton, rice, soybeans and corn."

5. "Poultry loans are hazardous. Too much needed in relation to net worth."

6. "Vegetable crops—put up 3 percent cash in a pledge fund. Usually have cotton and cattle."

7. "New adjustments included mostly in over-all operations. Have found strawberries, sweet potatoes, peaches and seed crops risky."

PCA credit has been important in establishing the tung industry. About $1.5 million was outstanding for this purpose. Much of this was to large operating companies or to individuals with sufficient net worth to have credit without chattels.

Time Period

Banks. Bankers reported that the majority of their loans of all types were written for one year or less, subject to renewal. They indicated that any agreement to renew was generally not written. Some fully expected cattle loans to run for three to five years but on a gentleman's agreement basis. One banker indicated that he would allow a dairy loan to continue for ten years, if warranted. One banker was found to be writing real estate loans on a ten-year basis. His comment was that if loans were selected carefully, this practice did not appear to be hazardous. Machinery loans were allowed to run for two crop years with one-third down and one-third at the end of each of the two succeeding years.

Bankers have been criticized for not making more farm loans for a longer duration. The criticism stems from the idea that the borrower should not have to gamble on the lender's willingness to renew the loan. Also, the fact that the face of the note indicates a specific maturity date doesn't necessarily mean that the liquidating possibilities of the loan are of that date. Therefore, the loan is actually for a longer period than indicated by the note. This argument concludes that farmers do not really have a dependable sources of intermediate credit.

Bankers relate that the present practice enables them to meet their requirement for maintaining liquidity. Also, it serves as a means of contacting and checking on borrowers' progress. It helps borrowers reappraise their situations periodically and generally keeps them more alert. It was felt that borrowers have confidence in those with whom they are dealing; therefore, they are under no unusual mental pressure.

Some bankers still recall how assets became frozen from 1930-33 as deposits fell and the desire of individuals to hold currency increased. Thus, securities had to be sold, loans liquidated whenever possible, and lending had to be slowed down considerably. This helps emphasize the point that banks are more suited to the area of short-term credit than any other.

There is considerable merit in making farm loans on the basis of expected income rather than on the basis of security. Lenders wholly agree that the forced sale of property generally does not benefit either party. Some related their sad experiences with trying to dispose of used machinery, for example. The prospects were never heartening.

Section 24 of the Federal Reserve Act was amended in 1953 to permit National banks to make farm loans based on timber production. Under certain conditions these loans may be amortized over a ten-year period. Up to 40 percent of the appraised market value of the timber could be obtained to supply intermediate to long-term credit needs. This privilege has been available to state banks.

Production Credit Associations. Although PCA's wrote loans for one year or less in conformity with the regulations controlling the Federal Intermediate Credit Banks, certain cattle loans were amortized over a three-year period.

The Federal Regulations regarding loans discounted by the FICB indicate that loans should coincide as nearly as possible with the marketing of crops or livestock from which liquidation is expected. With certain noted exceptions this is not to exceed one growing and/or marketing season, and usually not more than 12 months. Notes secured by dairy cattle may mature two and one-half years from the date of discount. These should be repaid on a monthly basis. It is desirable to apply a fixed proportion of the milk or cream check.

Certain guaranteed loans made to veterans under Public Law 346 may be made to mature in three years. After October 1954, PCA's were also permitted to make other "intermediate-term" loans written on a three-year basis.

Files Kept

Banks. The survey revealed a wide variation existing in the kind of files kept by banks on farm borrowers. In most instances, financial statements were not taken. This was especially true of the smaller loans. Bankers indicated that the kind of data which could usually be supplied by farmers did not warrant the trouble involved. Then too, they loaned more on the basis of the individual and their personal knowledge of him. Financial statements were taken for loans over $1,000; and, in any case a note or a deed of trust, involving chattels, was kept.

In those banks where agricultural agents were employed, the condition of loan folders and the completeness of their contents were more evident than in other banks visited. Their first project after coming with the bank generally was to establish a more complete system of records. In general, an attempt was made to follow the recommendations of the Bankers' Associations or the Federal Reserve Bank recommendations. The most complete records had information relating to the borrower and his financial status; something was given about his repayment possibilities including costs, prices, and production. The purposes of the loan and the security involved were also stated.

Bankers, through their own Associations and the Federal Reserve System, have excellent opportunities for guidance in dealing with farmers. It is recommended by their associations that bankers become more familiar with prospective borrowers and their plans, work out a budget and repayment schedule after analyzing needs and liquidating possibilities, and if a farmer is turned down for a loan, to advise him why his application was not acceptable.

Production Credit Associations. When the Production Credit System was organized, the importance of adequate records was recognized. PCA's have maintained an enviable position in this respect since organization. A uniform system of records is kept by each association, including all facts relating to the applicant and his loan. The loan folder contains the following items:

1. All correspondence with the applicant
2. Application for the loan
3. Field or inspection reports
4. Deeds of trust
5. Other

Facts gathered are aimed at answering the specific items outlined above and are accumulated over the years.

Repayment and Security Requirements

In view of what has been written, it follows that a great deal of subjective evaluation of the man and his ability to repay is employed in the final analysis by lenders.

Banks. Bankers, in most instances, indicated that a specific value was not placed on the liquidating security. Their expressed policies were as follows: conservatism, deal with bank customers, know the borrower personally, and in the absence of a substantial net worth, require security. They were quite flexible in their security requirements.

Several individuals said they used the loan value of cotton as a guide for determining the value of the harvested crop. On the average, 50 percent of this figure was the amount loaned. Here again, the amount of physical security would cause the loan figure to be raised or lowered. One banker in the Delta valued cotton at $50 per acre. Another gave a spread of $35 to $50. On the other hand, bankers may lend up to 85 percent of the value of warehouse receipts.

Cattle were appraised on a market value basis. Fifty percent of this figure was given as the average loan figure. Several valued cattle on a per head basis. Fifty dollars was given as the maximum loan figure.

The practice of encumbering all assets, especially with smaller borrowers, was followed, in that the values of these items were not rigidly determined. Then too, by following this procedure, additional financing could be accomplished without putting up more security, depreciation on equipment could be accounted for, and borrowers would be discouraged from incurring additional debts with other agencies. This practice also permitted banks to make loans similar to the budget-type loans of production credit associations. Some bankers were found to take part of a herd of cattle as security, whereas no PCA reportedly followed this practice.

While credit with more than one agency was not discouraged entirely, it was accepted more readily when a long-term loan was held in addition to the production loan for which application was being made.

Production Credit Associations. It is readily understood that the amount of security required in any sound credit transaction depended not only on the financial strength of the borrower but also on the type of enterprise involved and its repayment possibilities. It has been an established policy of the Production Credit System to lend only for those enterprises which were capable of producing income, regardless of the financial strength of the borrower. There were, however, some general guides used in taking security for particular kinds of loans. Excluding the man himself, poultry loans generally required all poultry and poultry equipment. There was generally a small land area connected with this type of operation. In the case of a dairy loan, all dairy cattle, equipment and feed crops were taken as security. In some cases, other livestock and work animals were also included. For dairy loans in general, more collateral was required in the highly specialized areas due to the increased risks resulting from rapid depreciation and increased replacement requirements. Livestock loans included all cattle and increases. If necessary, work animals and equipment were required. Crop loans might include workstock, machinery and equipment, and cattle as collateral. The loan was not considered too desirable if real estate was required to secure the loan. In case of a crop failure, this could be the first step in the loss of the farm by the individual. The amount of security required in a general purpose loan was determined by the enterprises involved and the plan of liquidation. The general procedure was to include all of the income-producing livestock and crops.

One manager stated, "While it is true we have over-all rules and regulations regarding lending, many things cannot be generalized about. We try to furnish a man his needs by evaluating him, his land, his record and the general economic outlook." They generally avoided individuals with split lines of credit. The applicant was thus encouraged to secure all of his short-term credit from one source. This was given as one reason for requiring more security than was actually needed. Otherwise it might be possible for some other lender to dispossess the borrower, if other liens were permitted to be made on property not encumbered. A study of PCA loans in 1950 showed that the ratio of collateral to loan value was found to be as high as 5 to 1 for small loans under $500 and only 1.3 to 1 for loans over $3,000.[17] This indicates that the smaller loans were more fully secured than were the larger ones.

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[17] Diesslin, H. G., and Heitz, G. E., "Budgeted Farm Production Loans of Production Credit Associations," Bulletin 557, Purdue, November, 1950.

Delta associations reported valuing cotton at 26 cents per pound. With the exception of the two southern associations which quoted 22 cents, the other state associations reported valuing cotton at 24 cents per pound. These figures were used as a basis of determining the liquidating value of the primary security, and were agreed upon by the Production Credit Corporation. It was pointed out that the amount loaned on liquidating security varied on the basis of the borrower and his request.

In valuing livestock, market value was used in the case of meat animals, with loans ranging from 50 to 70 percent of the estimated value. Breeder stock was somewhat more difficult to value. The reputation of the individual borrower and the quality and age of animals were weighted heavily, even though some attempt reportedly was made to arrive at a normal value. The concept of "normal" was not clearly defined. It merely referred to discounting present market value to some extent.

Machinery was appraised on the basis of "sound use value." A tractor was usually depreciated in three years.

Loan Charges

Banks.[18] The contract interest rate of banks ranged from 2.5 to 8 percent.

Collateral in the form of cotton warehouse receipts enabled the farmer to demand the prime rate in most cases. Some of the factors effecting rate differences were as follows:

1. Net worth of borrower—one of the two most important factors.
2. Size of loan—with some variation, loans up to $1,000 carried the highest rate. The breaking point for some was as low as $500. This is one of the two most important factors.
3. Purpose of loan—livestock loans generally were less than crop loans, and were considered as carrying less risk.
4. Security—warehouse receipts and bonds gave the prime rate.
5. Equipment was difficult to appraise and created a collection problem in case of default.
6. Maturity—risk and liquidity.
7. Competition for better accounts.

Precise statements concerning the cost of loans from banks can be made only by analyzing historical data of individual borrowers. A wide range of rates existed in any one bank, depending on the factors mentioned. In addition, the true rate depended on the methods of dispersing and repaying funds. For example, in analyzing 1,500 farm loans in selected banks in Ohio, the effective rate of interest was found to vary from 5.0 to more than 500 percent. "The loans with a cost of 5.0 percent were maturity loans made at a contract rate of 5.0 percent with no other charges. The loan with the highest cost (909.091 percent) was a loan of $40 outstanding for one day. This amount is equivalent to 11 cents for one year. A $1 minimum charge on this amount was responsible for the high cost ($1 -:- 0.11)".[19] The foregoing merely points out the range of rates possible. The median rate in the study cited was found to be approximately 7 percent.

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[18] Brown, **Op. Cit.,** Sec. 58, Code, 1942, Sec. 5212.

Small loans. Any bank in Mississippi may make loans in any amount, not exceeding $500 to be repaid in monthly installments and may charge interest thereon at not exceeding the maximum contract rate of interest per annum allowed by law for the entire period of the loan, and aggregate the principal and interest for the entire period of the loan and divide same into monthly installments, and may take security therefor as for other loans.

On loans not exceeding $50 payable in monthly installments, there may be made a charge in lieu of interest of not more than 50 cents per month. On loans not exceeding $100, but over $50, payable in monthly installments, there may be made a charge in lieu of interest of not exceeding 75 cents per month. A minimum charge of $1 in lieu of interest may be made on any loan whether payable in monthly installments or not.

No further interest or discount or service charge or other charge by way of compensation for the use of such money shall be made directly or indirectly on any such loan or discount by any such bank, trust company or national bank, made under the provisions of this act, in addition to the charges herein expressly provided for, except that there may be charged to the borrower:

> "A charge in an amount not exceeding $1 per $100 or fraction thereof of loans for the cost of credit investigation or appraisal of the security offered as collateral."

In general, the small collateral loans were charged a higher rate than unsecured loans by borrowers with a substantial net worth. Little bargaining was noted in small loans with 6 and 8 percent being reported and the effective rate depending on how quickly the loan was repaid. There were no differences in the contract rates reported in the Delta when compared with Upland areas. The only fees reported were the actual costs of legal services and of recording. Appraisals, when made, generally were not included as an extra charge.

The contract rate of interest in Mississippi is 8 percent, while the legal rate is 6 percent. The former means that parties to a transaction may not lawfully agree to more than an 8 percent rate, small loans and installment loans excepted. The legal rate applies as a maximum charge when no specific rate is agreed upon. In most states there have been little or no changes in these rates between 1925 and 1955.[20] The contract rates generally are higher than legal rates. In 1955, four states had no limit on the contract rate permissible, while 6 percent was the legal limit allowable.

Production Credit Associations. PCA's loan charges were inflexible. There were no provisions for varying the interest rate or the other charges because of the net worth or probable risk of the borrower. Loan charges did vary with the size of loan. Size of loan was the only factor determining total loan charges. Specifically, the regulation states: "The interest rate charged the borrowers shall be the rate prescribed by the Corporation, which shall not be less than 3 percent per annum nor more than 4 percent per annum above the discount rate of the FICB at the time the loan or advance is made, unless a lower or higher rate is prescribed by the Corporation with the approval of the Production Credit Commissioner."[21] This applied to both secured and unsecured loans.

Exceptions with regard to rates appeared in the Regulations regarding rates in 1954. PCA's may make guaranteed loans to veterans for "any agricultural purpose eligible for such guaranty . . . at a rate of 4 percent per anannum . . . for not more than 5 years." They may make insured loans under similar circumstances at a rate not to exceed 5.7 percent. Also, upon approval by the PCC and upon authorization by its board of directors, an association may make loans guaranteed by the CCC to finance the purchase or construction of storage facilities. These loans may be made at, "such rates of interest, with such maturities, and upon such other terms and conditions as the CCC may prescribe." Since October 1954, PCA's are permitted to make commodity loans on stored commodities at the preferred rate of 4 percent.

As to actual rates charged, seven associations had rates of 5.75 percent while three charged 6 percent. All three of the Delta associations charged 5.75 percent. As most of the loans made were reportedly of the budget type, the actual rate would be less than that indicated above. Under a budget loan, a borrower paid interest only on that amount of principal actually drawn from his line of credit, rather than from the time the original loan was made.

Examples of the loan charges, varying with the size of loan, were as follows:

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[19] Eckert, P. S. and Falconer, J. D., **Characteristics of Short-term Farm Loans Made by Ohio County Banks,** Bulletin 633, 1942.

[20] **Agricultural Credit and Related Data, 1955,** Agricultural Commission, American Bankers Association, p. 36.

[21] **Code of Federal Regulations,** Cumulative Packet Supplement for Use During 1954.

	Amt. borrowed	Charge	
Delta:	$ 50 - $ 200	$ 2	
	$ 201 - $1,000	1	percent of loan
	$1,001 - up	$ 10	plus ¼ of 1 percent of the amount of loan above $1,000, plus recording fees Maximum charge—$50.
Elsewhere:	$ 50 - $ 100	$3.50	
	$ 101 - 200	4.50	
	$ 201 - 300	4.50	
	$ 301 - 700	2.00	plus 1 percent of loan above $300
	$ 701 - 1,000	2.50	plus 1 percent of loan above $300
	$1,001 - up	13.00	plus ½ of 1 percent above $1,000, plus recording fees. Maximum charge ranged up to $85, depending on Association.

It should be observed that the above figures did not apply precisely to all associations, but the variations would not be large.

A portion of the Code of Federal Regulations relating to charges is as follows:

> "Except as authorized by the president of the PCC, the cost of title and mortgage abstracts and searches, fees for filing or recording mortgages, fees in connection with releases, notarial fees in connection with the execution of loan papers, and other expenses must be paid by the borrower."[22]

In addition to loan charges, a farmer must invest in stock amounting to $5 for each $100 borrowed. This amount may be included in the loan.

When additional advances are made, the additional fees in connection therewith, when added to previous fees, shall not exceed the fees which would have been charged if the total loan had been made at one time. No charge is made on interim loans.

Due to the cooperative aspects of PCA's, borrowers are entitled to patronage refund when declared. In the past, these have been made in the form of capital stock in the association.[23]

Farmers are also entitled to stock dividends on money invested in stock when declared. The Production Credit System is limited by law to a 7 percent dividend. Bylaws further reduced this limit to a 5 percent return on stock.[24] Dividends were paid to Class A stockholders by all three Delta associations for 1952 at a rate of 5 percent. In addition, one other association paid a 3 percent dividend on stock.

SUMMARY

Production Credit Associations and commercial banks have been providing a substantial portion of short-term credit needs of farmers in Mississippi. This was indicated clearly by their activities and reports. Only 1 of the 197 banks in the State failed to hold some type of farm loan at the beginning of 1955. Total agricultural loans outstanding at specific times showed considerable variations. At the beginning of 1953, $64 million were outstanding; $98 million existed in 1954, and $76 million in 1955. Guaranteed CCC loans held were primarily responsible for the variations. During 1954, Production Credit Associations loaned about $46 million to Mississippi farmers. Lending was divided as follows: crop production, 67 percent; livestock and dairy loans, 26 percent; poultry, truck and tung oil products, 7 percent.

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[22] **Ibid.**

[23] Spivey, R. E., Vice President and Secretary of the Production Credit Corporation of New Orleans, Speech made at the Cooperative Workshop held at Mississippi State College, June 3 and 4, 1953, p. 13.

[24] **Ibid.**

Banks and Production Credit Associations operate throughout the State, either through their main offices or their branches. Banks usually number from one to two per county with a range from zero to eight. There were only about 12 full-time farm agents in these banks in 1953, but indications were that the number would increase. In some cases an officer of the bank was delegated to work especially with farmers part of the time. Banks have been encouraged to diversify their operations and to supply all of the legitimate credit needs of the community. They offered convenience and other banking services.

The ten Production Credit Associations in the State have 54 field offices. The associations are divided into districts throughout the State. PCA's offer a specialized service for farmers, and their whole operation is aimed at providing sound short and intermediate term credit to agriculture.

During the period 1946-51, the average number of loans made by banks per year was 46,000; and for PCA's, 16,000. Banks loaned an average of $51 million per year or about $1,108 per borrower, and PCA's loaned an average of $31 million per year or about $2,000 per borrower. Bank volume has varied considerably according to the activities of the Commodity Credit Corporation.

While an over-all lending policy exists for both banks and PCA's, the difficulty of conforming the practices was made clear in the interviews with both groups. In regard to operations, interpretation of policy, knowledge of the situation, and conditions of the moment, all play a part. Liquidity has become increasingly important to banks as demand deposits have continued to increase. The legal lending limits are 10 percent of capital and surplus for national banks and 15 percent for state banks.

Phrases relating to lending limits often repeated in bank interviews were: "We are very selective." "We set our own lending limits." The size and the purpose of the loan were the two main factors in determining the extension of credit. Bankers in the Delta expressed a cautious view toward expanding their activities for large crop loans, including cotton. Cattle loans were considered more suitable from the bank standpoint.

Comments regarding farm lending varied as follows: "We lend only to owners, not tenants." "We want no crop loans." "We are very lenient . . . never ask for a waiver and only occasionally for an endorsement." Selectivity, strength of financial statements and endorsements were important in determining lending activities. Once a man was given a crop loan it was the bank's policy to see him through, even with additional advances. This explains somewhat the policy of requiring all the security available with the loan application.

Although PCA's have a potential lending capacity of ten times their net worth, their actual loans outstanding were approximately six or seven times this amount. The reason for this was the dampening effect that a higher ratio of loans to net worth would have on the borrowing capacity of the Federal Intermediate Credit Bank. Thus, as a practical matter, more funds would be needed in the Production Credit System in this area if its lending capacity were to be increased.

The lenders interviewed did not reveal strong competition in the demand for the average farm loan. However, a very wide variation was found in the desire of banks to engage in farm lending. This applied even among several banks in the same locality. Where farm agents were employed, banks were generally more zealous with respect to extending farm credit. The principal competitor of PCA's in the Delta was the Staple Cotton Discount Corporation. Production Credit Association managers felt banks could be quite competitive in those instances where they really desired farm loans.

PCA's indicated a willingness to extend themselves a little further in certain areas with new adjustment loans, although cotton was still the primary repayment crop. A change from this practice is currently taking place. A willingness to move ahead cautiously with respect to new production possibilities was noted. A primary example given was the development of the tung industry in South Mississippi. PCA's were instrumental in this development. The extent to which agencies will move into new adjustment areas will depend on the extent to which "sound lending" is followed as outlined in this report.

Although banks did report extending some cattle and real estate loans on a three-to-ten-year basis, one year or less was the rule. The sentiment was that the shorter the loan the better from the point of view of the bank. This was in line with their desire to remain liquid and to review the borrower's progress. An oral understanding was generally the basis for renewal.

When this study was started, PCA's were required to write their loans on a yearly basis or less. As a result of requests from Production Credit officials in the New Orleans District, the Federal Farm Credit Board approved, October, 1954, the making of "intermediate-term" loans up to three years. Through this provision Mississippi farmers now have access to credit for obtaining machinery and equipment, buildings, irrigation equipment, for making conservation improvements, for improving pastures, etc., on this basis. Heavy carryovers may also be financed on this basis, if it is apparent that longer-term credit would have helped avoid this in the first place.

Simplicity characterized the kind of files kept by commercial bankers on farmer borrowers. Financial statements were taken on loans over $1,000, and a note and a deed of trust were kept in any case. Generally, more complete records were maintained or were being developed where farm credit agents were available.

Production Credit Association records were quite uniform, and more complete than bank records. Individual loan folders included all correspondence with the applicant, applications for loans, field or inspection reports, deeds of trust, etc.

Banks generally did not place a value on primary security. Their policy may be summarized as follows: conservatism; deal with customers; know the borrower; and in the absence of a substantial net worth, require security. The average value of loan on security was about 50 percent. The practice, especially with regard to borrowers of small amounts, was to encumber most of the productive assets. This was done first, because security was not rigidly valued; second, additional advances often were required on the same security; and third, split lines of credit were discouraged.

PCA's placed more emphasis on primary security, although other credit factors were not overlooked. In general, small loans were more fully secured than large ones. Cotton was valued at 26 cents by the Delta associations, 24 cents in the Hill section of the State, and 22 cents in two southern associations.

Banks have a definite advantage over PCA's with regard to flexibility of interest rates. Their contract rates varied from 2.5 percent to 8 percent depending on the following: net worth, size of loan, purpose, security, maturity-risk and liquidity, and competition for the better loans. Production Credit Associations must conform to federal regulations with regard to interest charges. For regular production loans they are not allowed to charge less than 3 percent per annum nor more than 4 percent per annum above the discount rate of the Federal Intermediate Credit Bank, unless otherwise prescribed by the Production Credit Commissioner. Since the latter part of 1954, PCA's may make commodity loans for crops stored in bonded warehouses at the preferred rate of 4 percent. They may lend up to 94 percent of the appraised value of the commodity. They offer the advantage of the budget-type loan whereby interest is charged only for the time the money is in use. Banks, in some instances offered farmers a similar service by allowing them to establish "lines of credit" on a given amount of security whereby notes could be signed as needed. Production Credit Association contract rates averaged about 6 percent with a stock investment of $5 per $100 borrowed. Loan charges varied from a maximum of $50 in the Delta to $85 in other areas of the State.

Appendix Table 1. Non-real-estate loans to farmers: Amounts held by principal lending institutions, Mississippi.

	All operating banks		Agencies supervised by Farm Credit Administration		Farmers Home Administration		
			Production Credit Association	Federal Intermediate Credit banks			
DATE	Excluding loans guaranteed by Commodity Credit Corp.	Including loans guaranteed by Commodity Credit Corp.	Excluding loans guaranteed by Commodity Credit Corp.	Excluding loans guaranteed by Commodity Credit Corp.	Production and subsistence loans	Disaster loans	Emergency crop and feed loans
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
1935:							
Jan. 1		8,728	262	0	271	32	1,506
July 1			4,053	2,892	2,291	14	2,471
1936:							
Jan. 1			284	4	3,047	8	1,483
July 1		7,945	5,045	2,981	5,365	5	1,959
1937:							
Jan. 1		3,412	377	0	4,724	3	1,430
July 1		9,866	6.304	2,962	5,574	3	1,985
1938:							
Jan. 1		9,350	897	1,164	2,710	3	1,442
July 1		14,253	6,730	2,496	5,714	2	1,934
1939:							
Jan. 1		16,107	1,187	591	4,840	1	1,456
July 1		18,008	6,578	2,634	9,692	1	1,907
1940:							
Jan. 1		9,758	1,650	474	8,482	1	1,574
July 1		13,882	7,469	2,780	11,652	1	2,338
1941:							
Jan. 1		11,379	2,670	650	11,012	1	1,765
July 1		13,124	7,804	3,139	16,394	1	2,393
1942:							
Jan. 1		15,336	2,437	1,599	14,453	1	1,843
July 1		15,763	9,544	3,401	20,230	1	2,474
1943:		25,732					
Jan. 1	17,801	26,127	2,818	4,878	16,591	1	1,811
July 1		17,635	10,199	3,753	19,481	377	2,342
1944:	19,130	32,482					
Jan. 1	19,300	32,754	3,961	4,355	15,335	264	1,894
July 1	13,157	22,108	11,991	3,121	16,910	194	2,335
1945:	17,317	40,959					
Jan. 1	17,452	41,241	4,484	5,003	13,081	108	1,853
July 1	14,581	38,333	12,168	2,895	14,541	69	2,300
1946:	19,917	34,826					
Jan. 1	20,093	35,002	5,143	3,866	12,023	39	1,902
July 1	19,027	20,434	14,343	3,988	14,181	21	2,343
1947:	16,433	16,917					
Jan. 1	16,619	17,103	7,264	6,886	13,160	16	1,848
July 1	21,338	21,393	17,304	5,275	15,425	14	1,785
1948:	15,087	15,661					
Jan. 1	15,175	15,749	5,560	4,977	12,452	12	1,732
July 1	27,537	27,597	20,415	6,963	13,970	11	1,556
1949:							
Jan. 1	18,630	42,176	6,529	6,791	11,606	11	1,446
July 1	30,649	43,904	22,399	6,242	13,257	8	1,214
1950:							
Jan. 1	18,675	29,252	8,943	3,937	12,832	135	983
July 1	30,753	33,846	23,126	5,917	12,825	5,755	759
1951:							
Jan. 1	21,981	22,088	8,071	4,122	11,532	1,817	653
July 1	35,705	35,720	28,440	7,202	12,455	4,700	568
1952:							
Jan. 1	24,542	27,577	11,295	3,945	11,047	1,707	475
July 1	44,374	45,022	33,991	8,481	11,909	4,098	382
1953:							
Jan. 1	44,339	47,442	16,191	6,065	12,235	2,458	318
July 1	45,607	47,380	35,303	8,305	12,201	5,391	251

Source: Agricultural Research Service, U.S.D.A.

Appendix Table 2. "Other Agricultural Loans." Reported by Insured Commercial Banks in Mississippi, December 31, 1952.[1]

County	Other agricultural loans	County	Other agricultural loans
	(000)		(000)
Adams*	$ 432	Lincoln (Lawrence)	
Alcorn (Tishomingo)		Lowndes*	1,117
Amite (Wilkinson)		Madison*	1,622
Attala (Madison)		Marion*	397
Benton (DeSoto)		Marshall	1,051
Bolivar	1,573	Monroe	951
Calhoun (Lafayette)		Montgomery	346
Carroll (Yazoo)		Neshoba**	240
Chickasaw	669	Newton (Jasper)	
Choctaw [2]		Noxubee	1,253
Claiborne*	1,282	Oktibbeha	275
Clarke	121	Panola	1,523
Clay (Lowndes)		Pearl River**	113
Coahoma	5,978	Perry (Forrest)	
Copiah	462	Pike	681
Covington*	207	Pontotoc (Lee)	
DeSoto*	935	Prentiss (Tishomingo)	
Forrest*	271	Quitman*	1,376
Franklin (Wilkinson)		Rankin (Simpson)	
George**	150	Scott	669
Greene (George)		Sharkey (Washington)	
Grenada (Tallahatchie)		Simpson**	371
Hancock (Pearl River)		Smith (Simpson)	
Harrison	73	Stone (Pearl River)	
Hinds	493	Sunflower*	3,831
Holmes	695	Tallahatchie*	2,479
Humphreys (Sunflower)		Tate	799
Issaquena [2]		Tippah	233
Itawamba [2]		Tishomingo**	547
Jackson	11	Tunica (Quitman)	
Jasper*	423	Union [2]	
Jefferson (Adams)		Walthall (Lawrence)	
Jefferson Davis (Marion)		Warren (Claiborne)	
Jones	420	Washington*	3,755
Kemper (Neshoba)		Wayne (George)	
Lafayette**	406	Webster (Lafayette)	
Lamar (Covington)		Wilkinson**	340
Lauderdale	411	Winston (Neshoba)	
Lawrence**	327	Yalobusha	481
Leake	278	Yazoo*	409
Lee*	1,265		
Leflore	2,495	STATE TOTAL [3]	$44,236

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[1] These data are classified by counties according to location of bank. Data for any county with less than three banks are not shown separately, but included with those for the county named in parentheses. Asterisks indicate that data for additional counties are included, the number of asterisks representing the number of additional counties.

[2] No insured commercial banks in county.

[3] Because of rounding, the totals may not always agree with those published by F. D. I. C.

Compiled from F. D. I. C. data.

Appendix Table 3. Index of annual average, demand, time, and total deposits of country banks, Mississippi, Arkansas, and Louisiana, 1923 to 1953, (1947 - 49 = 100).

Year	Total deposits	Demand deposits	Time deposits
1923	23	19	41
1924	23	18	46
1925	27	20	59
1926	28	20	66
1927	26	18	64
1928	25	18	62
1929	26	18	62
1930	23	15	60
1931	17	11	47
1932	13	7	36
1933	11	7	31
1934	14	10	35
1935	16	11	39
1936	20	15	40
1937	22	18	41
1938	22	17	42
1939	22	18	43
1940	23	19	45
1941	27	23	45
1942	35	33	45
1943	47	49	43
1944	60	62	51
1945	79	81	67
1946	95	97	85
1947	96	97	95
1948	101	101	101
1949	103	103	104
1950	104	104	106
1951	110	110	108
1952	118	118	119
1953	127	126	132

Source: Agricultural Finance Review., Vol. 15, Supplement 1, May, 1954, p. 54.

In preparing indexes for group of states and amounts of monthly deposits for each state are weighted by the cash farm income of each state in the base period.

Annual indexes are simple averages of monthly indexes which are based on average amounts of daily deposits.

Indexes are based on deposits of member banks of the Federal Reserve System located in places of less than 15,000 population.

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BULLETIN 540 **MARCH, 1956**

INDUSTRIALIZATION
AND A
MARKET FOR FOOD PRODUCTS
IN THE
LAUREL TRADE AREA

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

1956
STATE COLLEGE

ACKNOWLEDGMENT

Thanks are due to the families and merchants who furnished information for this study and to the local women who assisted in obtaining data from homemakers; to the secretary of the Jones County Chamber of Commerce; and to the County and Home Demonstration Agents of the Mississippi Agricultural Extension Service for their helpfulness.

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Industrialization and a Market For Food Products In the Laurel Trade Area

By

Dorothy Dickins, L. D. Welch, Virginia Ferguson, and W. E. Christian

INTRODUCTION

It was the purpose of this survey to show to what extent industrial expansion has helped local farmers by furnishing additional markets for food products; also to point out possibilities for increased benefits to farmers from an industrial program.

The report includes information from retailers and processors handling milk, pork, broilers, beef, eggs, leafy vegetables, sweet potatoes and tomatoes. It also includes information from representative families in the Laurel trade area concerning food consumption practices and preferences regarding these foods.

Market and family data are related to help answer questions such as how industrialization has increased market outlets for farmers and as a basis for suggesting ways in which the increased market due to industrialization can better be made available to local producers.

Jones County was selected as the locale of this study for the reason that it has long been one of the State's most highly industrialized areas as well as an agricultural area. Throughout this study employment in manufacturing industries is taken as a measure of industrialization. Latest available Department of Commerce statistics indicate that the county ranks fifth in the State in number of establishments engaged in manufacturing, but third in the number of employees working in such industries. Farm census data also indicate that the county ranks well within the upper fourth of counties in the State from the standpoint of number of farming units. It was therefore felt that any impact which industrialization of an area predominantly agricultural might have upon the markets for locally produced food products would have had time to make itself felt in Jones County.

Latest census statistics reveal that 19,009 persons out of a total civilian labor force of 19,718 in the county were gainfully employed in 1950. Percentage distribution of employment among principal industry groups that year was as follows: agriculture, 18.9 percent; manufacturing, 30.7 percent; and trade, service and other industries, 50.4 percent. Thus the importance of manufacturing industries to the economy of the area is emphasized when one considers that approximately one out of three gainfully employed persons in the county is employed in manufacturing. The State-wide average of workers so employed in 1950 was one out of eight.

Much of the industrial development in Jones County has been tied to the forest resources of the area, with firms engaged in the manufacture of wood products providing more than two-thirds of the jobs in manufacturing. Major wood processing industries, and the average monthly employment in each during 1954 were: pulp and paperboard mills, 2850; millwork and plywood products, 575; lumber mills, 446; naval stores products, 92; and office furniture, 39. The processing of other products also provides employment for large numbers of workers. Larger plants in this group, and 1954 average monthly employment in each, were: a garment plant, 597; a textile mill, 312; and a vegetable canning plant, 125. Many smaller plants, each employing eight or more workers, bring the total number of manufacturing establishments in the county to 53 in 1954.

Appendix Table 1 shows a breakdown of yearly average employment, payrolls and average annual wage per worker in manufacturing and other non-farm industries in Jones County for the period 1950-54. This table points out the increasing importance of manufacturing employment as a source of income to the area. Not only has such employment steadily increased, after a slump in 1951, but the average annual wage received per worker has likewise risen steadily to about 122% of the 1950 level. One factor, not detectable from a table of average annual employment statistics, but important to the economy of an area, is the seasonality of employment. Figure 4 shows that while employment in some industries, such as pulp and paperboard, is at a relatively constant level throughout the year, others are highly seasonal in employment. The net result is that total manufacturing employment in the county is high after mid-year, but relatively low during the early months of the year. This may have a definite bearing upon consumer purchases of food and other products.

Agriculture practiced in the area is mainly of the general type. Small farms predominate, the most common size unit being less than 30 acres. Principal cash farm income is derived from cotton and small-scaled livestock enterprises. Vegetables for the market are produced on many farms, though few farms in the county could be classed as primarily truck farms. Cattle production has increased rapidly in the county within recent years. Latest census data indicate an increase of more than 69 percent in the number of cattle and calves sold from farms in 1954 as compared to 1949.

The six percent decrease in number of farming units in the county from 1949 to 1954 would indicate that many persons previously engaged in agriculture have left the farm for manufacturing or related employment in town. Others, though remaining on the farm, have relegated their farming operations to a part-time basis to permit themselves to work in urban jobs. These movements should mean greater market potentials for those who continue to produce food products for the local market.

THE FAMILY SURVEY

Two hundred and fifty-six families in Jones County were interviewed during May 1954. One hundred and twenty-seven lived in Laurel, henceforward designated as the **Urban Area**; and 129 lived within a 10-mile radius of the city, henceforward designated as the **Rural Area.**

Dr. Earl E. Houseman, Statistical Assistant, Office of Marketing Services in the U. S. Department of Agriculture, drew the areas in which the rural interviewing was to be done in such a way that a representative sample of all families in the area were visited. Rural areas were sampled at the rate of about one in eighteen.

The urban sample was drawn from the Laurel City Directory. Every thirtieth name was drawn from the directory. However, data were obtained from only those families who had two or more members who have at least one meal per day in the home together. It is this type of family that is most important from the consumer-market viewpoint. Likewise, families in existence less than one year were not surveyed, since it was necessary to relate consumer-market data to annual family income.[1]

Supplementary data were obtained by questionnaire from 33 percent of the urban and 40 percent of the rural sample in September 1954. Families returning the questionnaire had slightly higher incomes than families in the corresponding sample.

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[1] There were 174 addresses with 165 families in the Laurel sample and 154 dwellings with 150 families in the rural sample. In Laurel 21 of the addresses were vacant, could not be located on account of a change in street, or were business addresses only at the time of the interview; 23 families were ineligible; 15 homemakers could not be contacted or were unable to cooperate. In the rural sample 4 of the 154 dwellings were vacant at the time of the interview; 9 families were ineligible; 12 homemakers could not be contacted or were unable to cooperate.

Description of the Families

Urban and rural familes in these samples were very much alike in certain respects. Both groups had the same average number of members, i.e., 3.8. In 17 percent of the urban families and 21 percent of the rural families the family head was 60 years or over. But the rural sample contained more white families than did the urban sample. Eighty-eight percent of the families in the rural area and 64 percent in the urban area were white families.

Both husbands and wives in rural families had somewhat more schooling than those in urban families. The percentage of families with husbands and wives who had completed high school or attended college was:

	Urban	Rural
Husbands	32%	37%
Wives	34%	44%

Likewise, more husbands and wives in urban families had not completed grammar school. The percentage of families having husbands and wives with this little schooling was:

	Urban	Rural
Husbands	25%	21%
Wives	26%	15%

Better schooling of the rural groups is related to the larger proportion of white families in the sample.

There are two types of facilities which are closely related to shopping habits of the consumer-buyer. These facilities are communication and refrigeration. The percentage of families having specified facilities of these two types are shown in Figure 1.

Source and Distribution of Family Income

From what sources did urban and rural families obtain their incomes? What were family incomes the year preceding the interview (1953-54)? What members had had off-farm experience? Answers to questions such as these give basic background information for understanding the local food marketing situation.

More families in both urban and rural samples received income from off-farm earnings than any other source, as is shown:

Families with:	Urban	Rural
Income from farm operation	2%	38%
Income from off-farm earnings	90%	78%
Income from other sources	37%	33%

Income from "other sources" includes income from pensions, welfare payments, interest, net from rental property, oil leases, and the like. Percentages in the above summary total more than 100 because some families received income from a combination of these sources.

Figure 2 shows the distribution of urban and rural families by net cash income.[2] As will be noted, the greater percentage of families, both in the urban and rural samples, had incomes of $1000-$2999.

When the urban families are arranged by net money income from the lowest to the highest, the income of the middle or 64th family was $2750. When the rural families are thus arranged, income of the middle or 65th family was slightly less, or $2400. But there was a difference in the middle income rural family who operated a farm and the middle income rural family who did not. The income of the middle farm operator family was $1832; that of the rural non-farm family $2714. It would seem that in spite of industrial development the farmer still lags behind in returns for his labor.

Income per capita (1953-54) was figured for Jones County using as a basis incomes of the 256 families included in the survey. Thus figured average per capita income was $783.

To understand the occupational situation of an area it is necessary not only to know the income, and the proportion of families deriving income from different sources, but also the main occupation of the family head,

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[2] In a few cases where income was not obtained the family was placed in an income class on the basis of kind of work and other types of socio-economic data that could be secured.

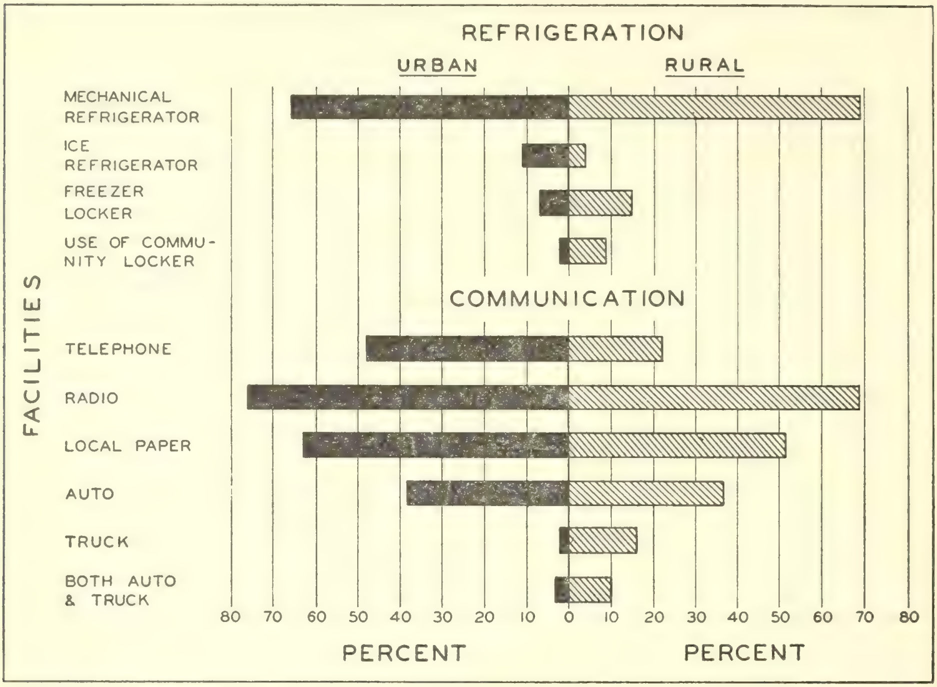

Figure 1. Percentage of urban and rural families with specified refrigeration and communication facilities.

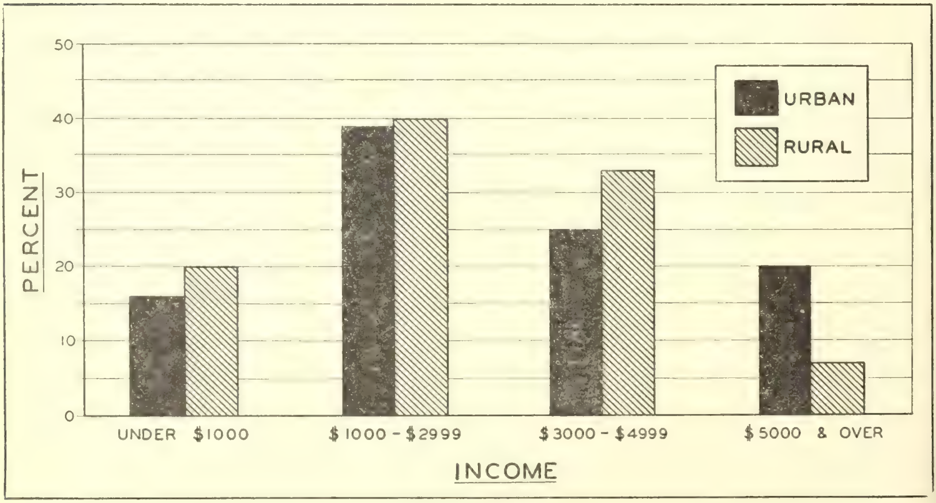

Figure 2. Distribution of urban and rural families by net income, 1952-53.

wife, and other employed family members.

As is known, some persons have more than one occupation; that is, they are farm operators, and have work off the farm also. Listed below is the proportion of families in the survey with specified members having as their **main** occupation work other than farm operation. Also shown is the percentage of those engaged in non-farm work who had jobs in manufacturing.

	Urban		Rural	
	Non-farm	Non-farm mfg.	Non-farm	Non-farm mfg.
Husband or male head	74%	43%	66%	30%
Wife or female head	28%	18%	14%	36%
One or more others in family	9%	11%	7%	29%

It is to be noted, however, that 99 percent of the husbands in the urban sample and 81 percent in the rural sample had done non-farm work of some kind at one time. About two-thirds of the wives in both samples had done work of this type since marriage. In other words, many more had had non-farm experience than were engaged in non-farm work, May 1954.

Consumer Shopping Habits

The middle income (or 64th) family in the urban sample spent about $232 per capita per year for food; the middle income (or 65th) family in the rural sample spent about $126. But families varied greatly in per capita expenses for food. Food expenditures were figured for the county using as a basis expenditures of the 256 families. Thus figured average per capita expenditures were $188. This estimate is slightly lower than the estimated $196 per capita expenditures for food derived from taxable retail food sales (see Table 2, column 3, 1954); probably due to more people from outside the county buying in the county than vice versa.

The 256 survey families spent an average of 24 percent of their income for food. As will be noted from Figure 3, about the same proportion of the retail dollar (using retail sales in Jones County compiled from Tax Commission reports) was spent for food.[3] Increases in the percentage of the consumer's dollar spent for food in 1954 over the five-year average (in both county and state) indicate an increasing dependency upon the market for the food supply.

Grocery stores used: There was not so much difference in number of groceries traded with by urban and rural families, but rural families in this county traded around somewhat more than did urban families. The percentage of families mentioning specified numbers of groceries at which they traded was:

	Urban	Rural
One grocery store	27%	23%
Two grocery stores	40%	37%
Three grocery stores	28%	36%
Four or more grocery stores	5%	4%

Ninety-nine percent of the grocery stores named by urban families were in Laurel, while less than half (46 percent) named by rural families were in Laurel.

Homemakers were questioned about years they had traded with these groceries and store loyalty seemed to be somewhat more prevalent among rural families. About one-tenth of the grocery stores named by rural families and two-tenths by urban families had been traded with a year or less. Forty percent of the stores named by urban families and 43 percent by rural families had been traded with more than 5 years.

Although rural families included in this survey lived within a 10-mile radius of Laurel, there were 10 families (about 8 percent) who lived further by way of the road to the city.

About one-third (34 percent) of the rural families did not mention a Laurel grocery store when asked to report grocery stores where they traded. Three of the 44 families not mentioning a Laurel store lived less than 5 miles from the city, but the majority (73 percent) not mentioning Laurel grocery stores were 8 or more miles away.

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[3] Table 3 in Appendix gives dollar volume of taxable retail sales.

The wife (or female head) was the person who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. But men in rural families engaged in this activity a little more frequently than men in urban families.

Buying from local producers: The amounts of specified food products

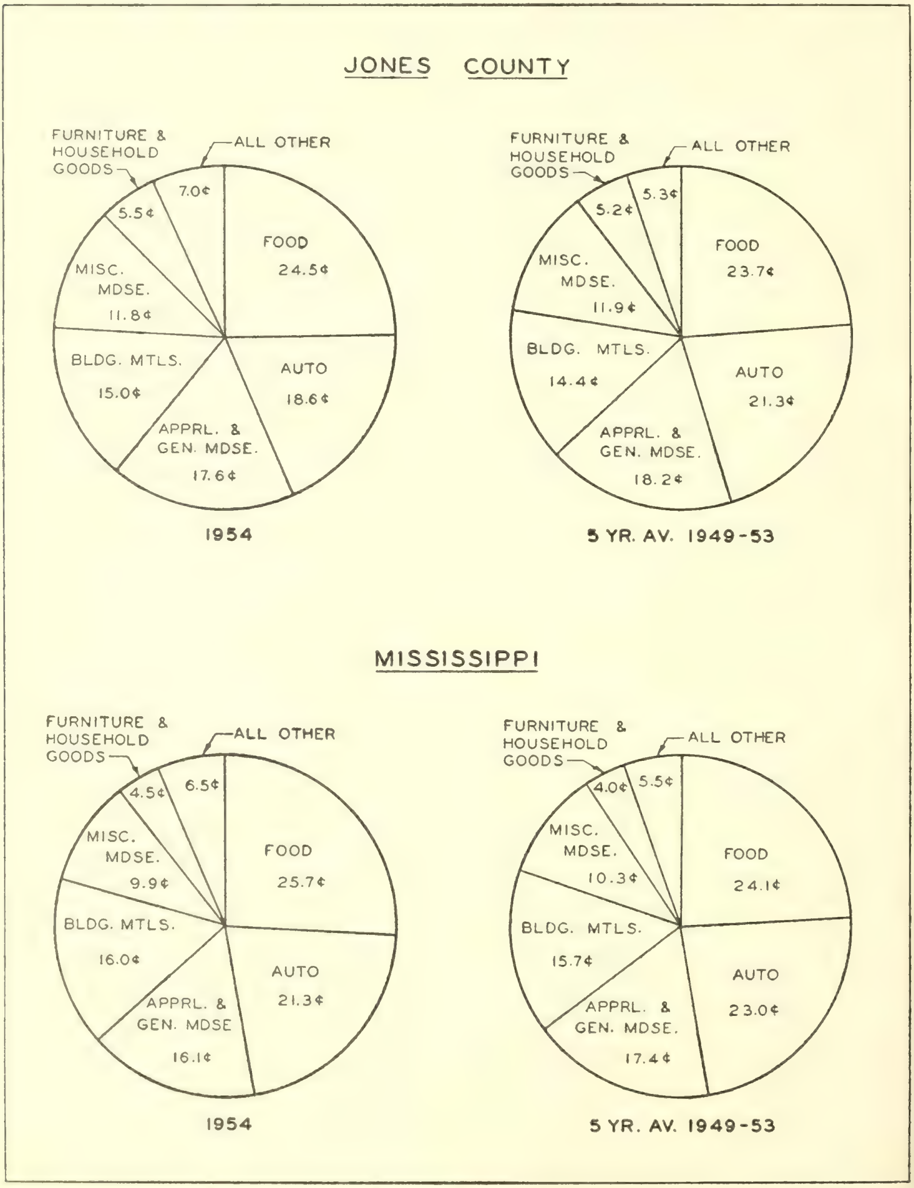

Figure 3. Division of the Retail Dollar by Classes of Consumers Goods, Jones County and Mississippi.

purchased from local producers by urban and rural families during one year (1953-54) are shown in Table 1. These are estimates made from purchases by urban and rural families in the survey blown up to represent the entire county. Also the percentage of families buying each product this way is shown.

Eggs was the product which more families bought direct from producers (see Table 1). In "beef and veal" and "pork" are included animals purchased at livestock market for slaughtering and use in the locker or home freezer. A good deal of the purchasing from local producers was from relatives and neighbors, but most of the whole milk bought by urban families from producers was purchased from a farmer who pasteurized his milk and delivered it to the family.

The majority of homemakers did not purchase any of these foods from producers nor did they desire to buy this way. One of the important reasons given was the inconvenience. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled. For rural people inconvenience was a less important reason. "Produce own, don't need" was the comment most often given when questioned about buying direct from producers. Urban homemakers when questioned about practices of buying from producers often gave comments indicating they wanted certain services not ordinarily given by producers such as inspection of meat, poultry dressed and cut up, privilege of buying in small quantities, credit.

Other shopping habits: The amounts of purchased vegetables, eggs, broilers, and pork during the week and amounts bought at the last purchase were about the same. For beef the amounts at the last purchase were considerably higher than amounts used. Some families bought meat in large quantities (from wholesale meat distributors, farmers, livestock markets, slaughter houses). These last purchases raised the general average. Meat for freezing seems to offer a potential market for farmers in the area. As has already been pointed out 7 percent of the urban families had a freezer locker, 2 percent used the community locker. (In rural areas 15 percent had a freezer locker, 9 percent used the community locker. These proportions may increase with time, especially if good meat is available.)

From sample data it would seem that milk is purchased about 4 times a week. Rural families who used purchased milk used an average of 8.54 quarts and their last purchases averaged 2.13 quarts. Urban families who used purchased milk used an average of 9.53 quarts and their last purchases averaged 1.83 quarts.

The percentages of families whose last purchase[4] of certain foods made at a retail grocery store in Laurel are shown below:

Purchased food	Urban	Rural
Mustard greens	100%	0%
Turnip greens	95%	33%
Cabbage	100%	57%
Tomatoes	85%	34%
Sweet potatoes	86%	67%
Whole milk	72%	32%
Buttermilk	85%	29%
Broilers	94%	47%
Ham	94%	60%
Sausage	100%	47%
Pork chops	97%	56%
Fat back	100%	43%
Bacon	99%	48%
Beef hamburger	98%	61%
Beef roast	97%	57%
Beef steak	96%	44%
Eggs	70%	19%

Vegetables not bought in Laurel were most often purchased from groceries in other areas of the county, a few purchased direct from farmers. Tomatoes were bought by a number of families, especially rural families, from Florida truckers. Much of the milk not purchased from Laurel groceries was puchased from groceries in rural areas of Jones County. Only 5 percent of the last purchases of whole milk made by rural families and 19 percent by urban families were from creameries.

When last purchases of specified foods were classified by whether for cash or credit it was found that about one-third of these purchases were credit. Urban and rural families did not differ much in this respect, but slightly more urban families used credit.

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[4] Includes only families using during report week specified foods obtained by purchase.

Any locally-produced food has to compete with the processed product as well as other foods of similar type. Consumer buyers like a change. Thus, fresh turnip greens compete with canned and frozen greens as well as with other green vegetables such as string beans, green peas. Beef competes with fish, with lunch meat and the like. For this reason it is important to know about spending patterns of competing foods as well as of locally-raised products.

Table 2 gives estimated amounts spent by Jones County families for the specified foods and competing foods during one week based on purchases of urban and rural families in the survey, May 1954. The seasonal nature of these data should, however, be taken into consideration.

Figure 4 shows that manufacturing employment in the county is fairly seasonal. The peak occurs in the summer when employment in lumber and wood mills is at the maximum. Most of the consumption data were obtained in May when employment in manufacturing was about average.

Sources of the Family's Food Supply

Many of the rural families in this survey carried on considerable home production, but only a few urban families did. Three of the 127 urban families were farm operators. Then, too, several non-farm urban families on the edge of town kept poultry and/or a milk cow. City ordinances forbade keeping of cows or poultry within the city limits at any point where they might be fifty feet from another dwelling or keeping hogs where they were kept within a distance of 250 feet of any dwelling. Ten percent of the urban

Table 1. Estimated total amounts of specified food products bought from local producers during 1953-54 by urban and rural families in Jones County and percentage of urban and rural families buying this way.

Food product	Urban families		Rural families	
	Quantity bought	% buying	Quantity bought	% buying
Whole milk	191,586 qts.	14	273,412 qts.	8
Eggs	206,407 doz.	46	104,366 doz.	19
Broilers	78,042 No.	9	29,753 No.	6
Tomatoes	45,399 lbs.	20	10,164 lbs.	5
Sweet potatoes	153,738 lbs.	24	71,471 lbs.	11
Leafy vegetables	70,209 lbs.	24	11,689 lbs.	5
Beef and veal	30,063 lbs.	6	41,765 lbs.	9
Pork	1,642 lbs.	2	2,864 lbs.	2

Table 2. Estimated total amount paid for purchased specified foods and purchased competing foods used during one week, May 1954, by urban and rural families in Jones County.

Kind of food	Urban families	Rural families	Total
	$	$	$
Whole milk	10,506	3,229	13,735
Buttermilk	1,260	480	1,740
Other dairy foods, such as dry and canned milk, cream cheese, ice cream (does not include butter)	6,647	3,593	10,240
Fresh tomatoes	1,399	944	2,343
All other types of tomatoes, such as canned, tomato paste, tomato soup, tomato catsup, tomato puree	1,478	846	2,324
Green leafy vegetables	810	104	914
Green leafy vegetables, processed	67	54	121
All other green and yellow vegetables, fresh and processed	4,380	1,545	5,925
Sweet potatoes, cured	307	29	336
Sweet potatoes, canned	0	29	29
Irish potatoes, cured	1,048	459	1,507
Eggs	5,266	1,753	7,019
Broilers	7,559	2,314	9,873
Pork, fresh, cured or salted	11,673	7,913	19,586
Beef, veal - fresh	8881	10,536	19,417
All other meats, including fish and other poultry, lunch meats, wieners, canned meat of pork, beef	4,430	3,167	7,597

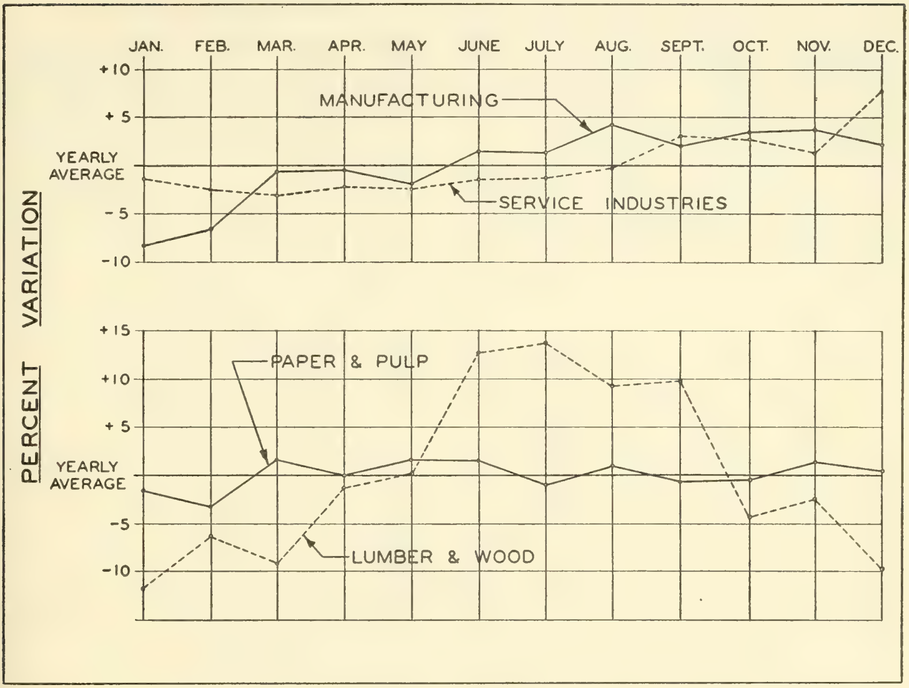

Figure 4. Average monthly variations in manufacturing employment, Jones County, 1950-54.

families reported use of some home-produced eggs, 6 percent some home-produced broilers, 2 percent some home-produced beef, 3 percent some home-produced pork, and 4 percent some home-produced milk during the previous year.[5] About 15 percent reported use of some home-produced vegetables. Use of the home raised products was reported by from 26 percent of the rural families for beef and veal to 82 percent for turnip greens. Fifty-two percent of the rural families reported use of home-produced pork, 61 percent of home-produced broilers, 70 percent of home-produced eggs, and 67 percent of home-produced milk during the year preceding the interview.

Average amounts of home-produced foods used by families producing were in all cases larger for rural families than urban families. Rural families carried on more food processing than did urban families.

From these data it would seem that most urban families and about one-third of the rural families depend largely on purchase for their food supply. Quite a number of families produce some products, especially garden produce. It is these low producers who present a challenge to marketing agencies within the trade area. Many of these low producers have the philosophy of "live at home" and think little about use of certain foods unless home-produced.

In 22 (17 percent) of the urban families and 31 (24 percent) of the rural families surveyed, the family head had shifted from farm to non-farm work.

Table 3 shows changes in production for home use by urban and rural families accompanying these shifts in occupation.

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[5] Home-produced refers to products raised by the family on land on which the family home may or may not be located.

Most urban families who had shifted occupation from farm to non-farm had ceased production. But most rural families who had shifted occupation continued home production for family use. This means that for situations in counties such as Jones where many farm operators shift into part-time farming and continue to produce much food for consumption, that the market for local food products would not increase as greatly as in counties where industrial families carry on little production for home use.

Figure 5 shows the percentage of families using specified foods during the report week in May and the percentage who reported home production as the source of these foods. Percentages using specified home-raised foods the past week are lower than percentages having used some of these during the previous year, since many families have these foods only at the peak production season. The meat percentages are for example considerably lower than the percentage of families having used some the previous year due to the fact that animals killed in the Fall had in many cases been eaten.

For many of the foods the proportion of rural families not using was higher than the proportion using the home product. In other words, the consumer who doesn't use certain products affords a bigger challenge to the food retailer than does home production. A large potential market lies in rural non-users (see Figure 5).

Consumption Patterns

Table 4 shows total amounts of specified purchased foods used during one week by urban and rural families in Jones County based on purchases of urban and rural families in the survey, May 1954.

As has been previously explained, consumption data were also obtained from some of these same families by questionnaire for one week in September 1954. When percentage of urban and rural families buying is compared during the report week in May and September, significant differences were found in amounts of purchased products used between the two periods in three meats and three vegetables. In all cases except one (turnip greens by urban families) larger proportions of families used the purchased food during September than May. These foods, where differences in two seasons were found, were for urban families, sweet potatoes, turnip greens, beef hamburger, beef roast; and for rural families, sweet potatoes, turnip greens, cabbage and broilers. There may be other seasonal differences in purchase not shown because of the limited number of Fall records.

Food consumption — income level: Tables 4, 5, and 6 in the Appendix show the proportion of families using specified foods from all sources and from purchase as well as the average amounts used from all sources and from purchase by families who used them. The changes in proportions using from lower to higher income are much great-

Table 3. Changes in production for home use accompanying shifts from farm to non-farm employment by family heads (in 17 percent of the urban and 24 percent of the rural families surveyed).

Food item	Urban families				Rural families			
	Ceased home prod.	Still produce	Never produced	Total	Ceased home prod.	Still produce	Never produced	Total
	%	%	%	%	%	%	%	%
Beef	18	5	72	100*	16	42	39	100**
Pork	82	14	4	100	42	52	6	100
Broilers	68	23	9	100	35	65	0	100
Eggs	68	23	9	100	29	71	0	100
Milk	82	9	9	100	23	77	0	100
Tomatoes	73	23	4	100	6	94	0	100
Turnip greens	68	27	5	100	7	94	0	100
Sweet potatoes	77	9	9	100*	48	52	0	100
Cabbage	72	14	14	100	6	94	0	0

* 5% produce now, but not when farmed.
** 3% produce now, not when farmed.

Table 4. Estimated total amount of specified purchased foods used during one week by urban and rural families, Jones County, May 1954.

Food	Urban families	Rural families	Total
Whole milk, qts.	44,250	14,992	59,242
Buttermilk, qts.	7,481	3,142	10,623
Eggs, doz.	10,971	3,873	14,844
Broilers, lbs.	14,879	4,793	19,672
Pork (no lard), lbs.	18,541	12,756	31,297
Beef, veal, lbs.	23,028	15,465	38,493
Fresh tomatoes, lbs.	8,301	7,323	15,624
Sweet potatoes, lbs.	2,861	277	3,138
Collards, lbs.	938	46	984
Turnip greens, lbs.	3,377	231	3,608
Cabbage, lbs.	6,402	1,525	7,927

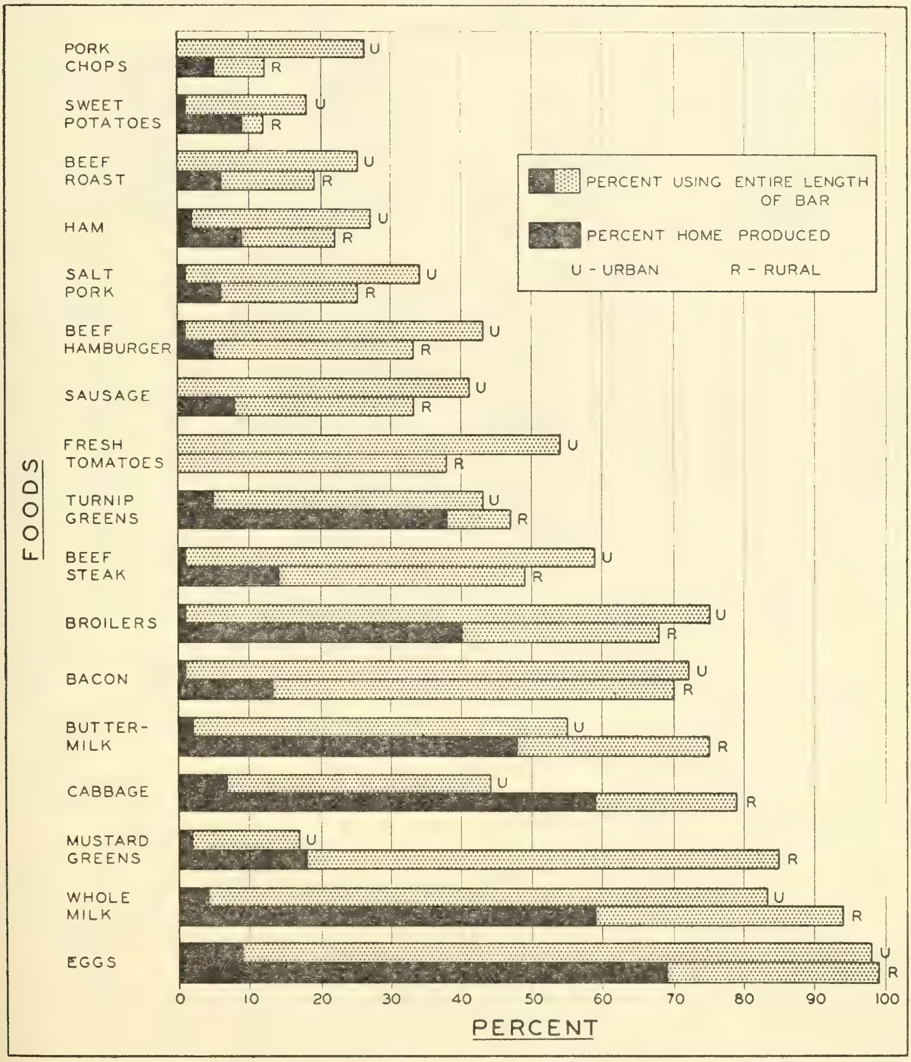

Figure 5. Percentage of rural and urban families using and producing at home specified foods during report week, May 1954.

er in case of percentage buying than in percentage using. Some low income families produce these foods for home use; a few such families have these foods given to them by relatives.

Larger proportions of families in higher income groups purchased animal products (whole milk, eggs, broilers, more expensive meat such as beefsteak, pork chops, beef roast, ham) and tomatoes than of families in lower income groups. The local supply of tomatoes had not ripened at the time of the study (see Table 4 in Appendix). The percentages of families purchasing salt pork tended to decrease as income became greater.

Average amounts of whole milk, meat, eggs, tomatoes, used by families using were somewhat larger in families of higher than lower income; of salt pork, smaller. (Tables 5 and 6).

Since non-users of these foods are important to the marketing it would be well to summarize briefly the most prevalent comments of urban and rural homemakers regarding non-use of these foods during the report week. Such a summary is included in Table 7 in the Appendix. As will be noted the principal reasons given by homemakers for non-use during the week were: (1) Use of a similar or other types of foods instead; (2) Costs—homemaker thought food too expensive, had no money, could not afford; (3) Dependence on home supply—"Tomatoes are not ripe", "cow dry"; (4) Family doesn't care or like very much the food; (5) Food not in season or considered inappropriate food for this time of year; (6) Food not in pattern of use—rarely or never buy or use; (7) Thinks food hard to digest, not so good for one.

Information concerning the use made of whole milk, buttermilk, tomatoes and eggs by the family was determined from each interviewee. The use made of a food product determines to a large extent the type of product which the consumer-buyer will want. Eight-tenths of the whole milk used by urban families, two-thirds by rural families was used as a beverage or in infant feeding. Milk for drinking needs to be especially palatable, fresh and cold, if it is to satisfy the consumer-buyer and maintain its continued use in large quantities.

All tomatoes used by urban families during the report week, May 1954, were used freshly sliced, or in salads or sandwiches. For rural families the percentage was 95. "Use fresh" means a demand for a firm, ripe tomato.

About two-thirds of the eggs used by both urban and rural families were used in egg dishes, such as fried eggs, scrambled eggs, poached eggs, and the like. An egg dish needs an egg of higher quality than if used in bread, cakes, or a scalloped dish.

Use of milk products: Records of milk products consumed at home by members of the 256 families were obtained. Milk used by each family includes not only the fluid milk but the fluid milk equivalent of evaporated, condensed, and dried milk, cream, ice cream and cheese. Conversion factors developed by the Human Nutrition Branch of the U. S. Department of Agriculture to express the nutritive value of each product as compared with fluid whole milk were used in converting milk products into equivalent quarts of fluid milk. (The factors apply only in equating the various milk products to fluid whole milk on the basis of protein and mineral content). Quantities of milk or its equivalent recommended for different family members in the revised low-cost food plan developed by U. S. Department of Agriculture home economists were used in estimating milk needs for the family.

About one-half the urban families and three-fourths of the rural families had 91 percent or more than the recommended amounts of milk products for families of their size and composition. It is to be noted (Figure 6) that twenty-three percent of the urban families and 11 percent of the rural families had one-half or less than the suggested amounts of this important kind of food.

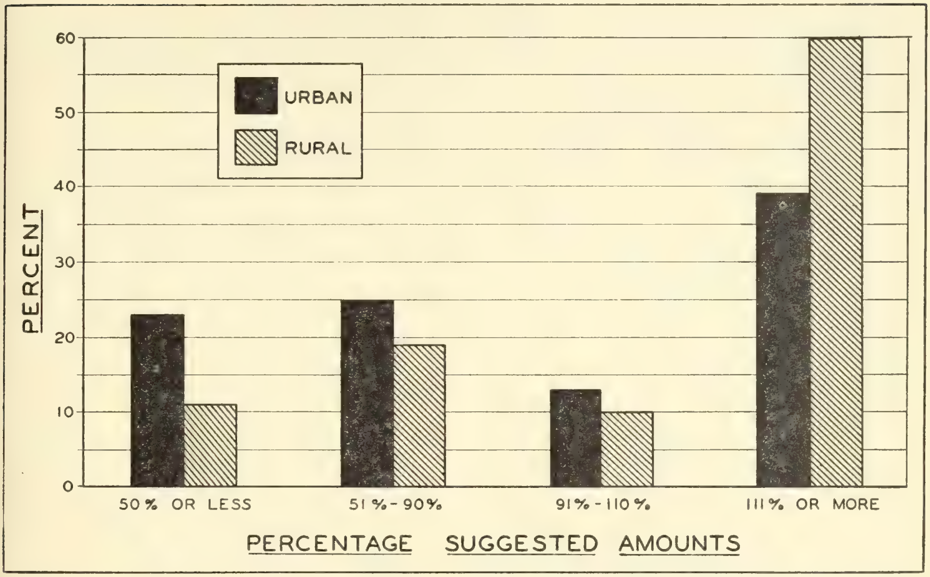

Figure 6. Percent of the 127 urban and 129 rural families using amounts of milk products during report week, May 1954, suggested in low-cost food plans.

THE MARKET SURVEY

In 1954 there were about 200 retail food stores in Jones County (100 of which were in Laurel). There were a number of food processing facilities available to producers. Plants affording such facilities in the county in 1954 were: 4 meat processing plants (2 packing plants and 2 sausage plants); 2 broiler processors (one also an egg dealer); 2 fluid milk bottling plants and creameries; 1 vegetable canning plant; 1 wholesale fresh vegetable shipper.

Quantities and Sources of Selected Food Products Moving Through Laurel Food Stores

The survey of food stores was confined to the urban area of Laurel. Records of purchases of the selected products were obtained from a one-third sample of the one hundred such stores in this city. In most instances these data were transcribed directly from invoices or other purchase records of the stores. For some items, where no itemized records were available, store managers estimated monthly purchases. In order to obtain seasonal differences in quantities and sources, the survey was repeated for the months of September, 1954, and January, 1955. Data obtained from the sample stores were then used to derive estimates of the total quantities of the selected items moving through all food stores in the city for each of the three months. These estimates are shown in Table 5.

It will be noted that no estimates for cabbage, greens, or sweet potatoes are shown in Table 5 for September and January. These items were omitted from the table since for those months data was not obtained from a sufficiently large number of stores to arrive at a reliable estimate of total quantities sold by all stores.

Beef: Local meat processors supplied approximately two-thirds of the beef moving through stores surveyed in May and January, and more than one-half of the total in September. Beef quantities shown in Table 5 include both carcass weights and wholesale cuts. Several of the smaller stores bought wholesale cuts only, rather than carcasses or sides. Operators of such stores stated that they preferred buying from local processors since they could get daily delivery of small quantities and thereby avoid maintaining excessive inventories. Several stores also bought cattle and calves, either at the livestock auction market or directly from producers, and had them slaughtered by local processors. Managers stated that this practice afforded them beef at prices appreciably lower than they would pay for packing-house beef of equal grade.

Most merchants stated that their greatest demand was for beef of the lower grades. Much of the beef moving through stores was not purchased on U. S. grades, so that no breakdown could be made by quantities of each grade purchased. While some stores purchased a high percentage of the U. S. choice or prime, data and comments of other merchants indicate that the larger proportion of total beef sold was of commercial or lower grades. Many of the merchants, in comparing quality and costs of locally slaughtered and shipped-in beef, stated that the beef supplied locally was equal in quality to that which they obtained from processors outside the area. Several also pointed out that there was an increasing supply of cattle of such quality being produced within the Laurel trade area.

Pork: The supply situation for pork was almost the reverse of that for beef. Locally slaughtered pork accounted for only about one-third of the total purchases in May and September and only slightly more than one-fifth of the total in January. One reason for this, however, is that pork totals as shown in Table 5 include both fresh and processed pork, and much of the processed pork was obtained from outside packers. No comparison was made on quantities of fresh pork items alone supplied by local and other sources. Had such comparisons been made, the percentages of local supplies would have been much higher. There were some purchases of hog carcasses from local processors, but in the main merchants preferred to buy fresh pork in wholesale cuts rather than in carcass form to avoid the problem of disposition of surplus fat. Heaviest purchases of local pork were in the form of sausage, which accounted for about 20 per-

Table 5. Estimated quantities of selected food items moving through retail food stores, Laurel, Mississippi, three months, by source of purchase.

Product	Unit	MAY, 1954			SEPTEMBER, 1954			JANUARY, 1955		
		Shipped in	Local	Total	Shipped in	Local	Total	Shipped in	Local	Total
Beef	lb.	54,696	94,719	149,415	68,415	81,855	148,110	43,872	96,858	140,730
	%	36.6	63.4	100	44.7	53.3	100	31.2	68.8	100
Pork	lb.	65,727	38,199	103,926	62,256	36,759	99.015	94,842	26,307	121,149
	%	63.2	36.8	100	62.9	37.1	100	78.3	21.7	100
Broilers	lb.	2,892	56,553	59,445	—	49.965	49,965	3,084	35,619	38,703
	%	4.9	95.1	100	—	100	100	8.0	92.0	100
Eggs	doz.	3,600	27,132	30,732	24,579	15,057	39.636	18,891	9,108	27,999
	%	11.7	88.3	100	62.0	38.0	100	67.5	32.5	100
Milk	qt.	—	116,943	116,943	—	102,765	102,765	—	90,384	90,384
	%	—	100	100	—	100	100	—	100	100
Tomatoes	lb.	21,252	6,615	27,867	16,092	2,094	18,186	15,204	—	15,204
	%	76.3	23.7	100	88.5	11.5	100	100	—	100
Cabbage	lb.	2,475	20,145	22,620						
	%	10.9	89.1	100						
Collards	doz.	—	957	957						
	%	—	100	100						
T. Greens	doz.	—	1,686	1,686						
	%	—	100	100						
S. Potatoes	bu.	3	423	426						
	%	0.7	99.3	100						

cent of all the locally slaughtered pork purchased.

Broilers: Results of the market survey indicate that local processors supplied more than 90 percent of the broilers which moved through Laurel food stores during the survey months. While one processor produced his own birds for processing, not all of the broilers sold to stores were grown within the immediate area. According to 1954 farm census data, relatively few broilers are produced in Jones County. A large part of the total supply was produced in nearby counties and sold to a local processor for processing and distribution as dressed broilers.

When questioned as to differences in quality or handling costs of broilers from local processors or other suppliers, most merchants saw no difference between sources. Freshness and daily delivery, enabling stores to keep smaller stocks on hand, were the reasons most often given for preference of the local product.

Eggs: That part of total egg supply which local sources provided varied with the seasons. Local supplies accounted for 88 percent of the total in May, 38 percent in September and 32.5 percent in January. This roughly follows the pattern of egg production of most areas of the State, since for Mississippi May is the month in which peak production occurs, and the seasonal low in egg production is reached in December and January.

Purchase data revealed few instances of egg-buying directly from producers in less than case lots. This would indicate that most of the local eggs are supplied by owners of commercial laying flocks, rather than by small farm flock owners as is the prevalent practice in many communities in Mississippi.

Most merchants stated that locally produced eggs were superior in quality to those shipped in, or that customer preference was for the local product when available, even though there might be no quality difference between local and shipped-in eggs.

Milk: During the survey period the fluid milk supply for Laurel was provided either by local processor-distributors or by a group of local producers who had milk processed at a distant plant and transported back to the area for distribution. Data obtained on sources of supply of fluid milk to processor-distributors were not sufficient to permit formulation of a reliable estimate of the percentage of total milk supply provided by producers within the immediate trade area.

Tomatoes: In considering the relative importance of local tomatoes to the total market supply, as shown by percentage figures for this product in Table 5, one must also consider the months covered by the data. In May, when 23.7 percent of the total came from local producers, the local crop had just begun to hit the market. By the time of the next survey, September, the production season for the local crop was ending, yet 11.5 percent of the total store movements was supplied by local producers. No locally produced tomatoes were available in January.

Retailers stated that consumers preferred locally produced tomatoes to those brought in from other sources. This preference was attributed to the fuller degree of vine ripening before harvest possible with the local product. Several grocerymen, however, pointed out that this same characteristic led to shorter shelf life and greater spoilage losses in the local tomatoes than occurred in tomatoes bought from produce wholesalers.

Leafy vegetables: Cabbages bought from local producers in May were in the form of small, green heads, and were bought by the dozen, rather than on the per pound basis by which produce houses supply the more mature heads. It will be noted from Table 5 that almost 90 percent of the May supply came from local growers.

All purchases of collard and turnip greens by stores in the sample were reported as being made from local producers. A common practice was for the produce buyer of each store to have supply agreements with one or more local producers. This practice tends to minimize risks accompanying both irregularity of supply and over-buying when supply is available.

Sweet potatoes: More than one-half (18 out of 33) of the stores participating in the study made purchases of sweet potatoes during May, 1954. Essentially all of these purchases were from local producers, with less than 1 percent of the total coming from wholesalers outside the trade area. As stated before, estimates were not made of total quantities of sweet potatoes and leafy vegetables moving through food stores during September and January since data were not obtained from a sufficiently large number of stores. In the case of sweet potatoes, however, a logical assumption would be that the preponderance of the supply for these latter months was also from local sources. If 99 percent of the supply was provided locally in May, an off-season month for sweet potatoes, then the local supply in the fall and winter months, when sweet potatoes are normally more plentiful in the area, should at least be proportionate.

Wholesale Outlets Available to Vegetable Producers

Jones County has long been to some extent a commercial vegetable producing area, but there is evidence of a downward trend in vegetable production in the area within the last few years. Preliminary data from the 1954 Census of Agriculture indicate a 30 percent decrease in number of farms selling vegetables in 1954 as compared to 1949, and a 23 percent decrease in acres harvested for sale in the same period. Thus it appears that while the number of farms producing vegetables for the market is declining, those continuing in the business are increasing the size of their operations.

The 279 farmers in the county who produced vegetables for the market in 1954 had access to two wholesale outlets for their produce. These outlets were a fresh vegetable shipper and a canning plant, both located in Laurel. At the time the market survey was made plans were also underway for the establishment of a county owned produce market. This market has now begun operations.

Fresh vegetables marketed by the wholesale shipper were primarily in the leafy vegetable group. Quantities purchased from local growers in 1954 were not ascertained in this study.

Data were obtained from officials of the canning plant on 1954 purchases at this plant of produce grown within the area. Because of the difficulty in defining the limits of the Laurel trade area, totals given in some instances were approximations only, and do not represent the entire purchases of each product by the plant, since an attempt was made to exclude from the data quantities transported from other producing areas. These data show that approximately 3.7 million pounds of leafy vegetables, 1.9 million pounds of beans, and 2.3 million pounds of sweet potatoes, as well as additional quantities of peas, pimento, and okra were purchased from nearby producers in 1954. Included in the 3.7 million pound (or 1854 ton) leafy vegetable total were: turnip greens, more than 892 tons; mustard, 610 tons; spinach, 206 tons; collards, 40 tons, and kale, 105 tons. This group alone accounted for an income to producers of more than $51,000.

Problems of Processors and Retailers in Buying Local Produce

Merchants were asked for expressions on problems they faced in buying from local farmers. The problems they mentioned were for the most part limited to vegetables. Few specific problems were mentioned, especially by buyers for food stores having verbal supply agreements with producers. Lack of variety, resulting in over supplies of some vegetables and shortages of others, appeared to be the most common obstacle. Several buyers pointed out the difficulty they experienced in getting producers to recognize that the type of produce retailers could move through their stores was determined by the wants of the consumer, rather than by what the producer had to offer. Over maturity of produce when picked, and handling methods resulting in quality damage before marketing were problems also frequently listed. A difficulty reported by operators of small neighborhood stores was that farmers with fresh produce to sell rarely called on them.

Insect damage to vegetables for canning was considered a major supply problem by officials of the canning plant. They pointed out that rejection at the plant of a load of insect damaged canning vegetables not only meant financial loss to both producer and processor, but also tended to discourage the grower in his plans for further production. They stressed the need for a more widespread adoption by producers of insect control measures. Tendency of producers to harvest vegetables beyond the proper stage of maturity for best canning quality created a second problem of supply, according to statements of the plant representatives interviewed. A third problem, which perhaps was enhanced to some degree by those mentioned above, was insufficient volume of production of some canning crops in the area, necessitating importation of vegetables from distant points.

Some Experiences of Farmers Trying to Sell Produce Locally

Farmers interviewed were asked if they had had any difficulties finding a market for the specified foods. Practically all the difficulties mentioned were related to the sale of produce. These are some of the typical replies: "One year grew turnip greens but failed to sell enough to justify getting them to market. Had to bring some back home." "After taking 50 bushels of greens in the Spring they wouldn't take any more. Had to plow up." "Several years ago had turnip greens turned down at canning plant." "Vegetables ruining in garden. Not trying to sell. Don't know who would buy." "Used to sell vegetables. Wasn't much of a market. Still can't get market. Reason stopped." "Several years ago had some vegetables turned down by shipper." "Raised a lot of vegetables for the canning plant. They took some of them, but they wouldn't take all of them." "Cabbage couldn't sell. Ruined in field. Hard to sell produce."

From conversations with many of these families it was evident that a number had produced vegetables hoping to find buyers at harvest rather than with a previous understanding to furnish a supply to particular buyers.

HOW INDUSTRY HAS HELPED SALE OF LOCAL FOOD PRODUCTS

Local products as has been shown in Table 5 were being sold in large quantities by Laurel food retailers. Most of the merchants seemed able to obtain what they wanted locally and were in the main satisfied with the quality of the products available.

During the long period of industrial growth in Jones County, Laurel has had an accompanying growth of food processing facilities. Most of the local products sold by the retailer were purchased from local processors, i.e., the meat packing plants, the sausage plants, the broiler processor, the milk bottling plants and creameries, the vegetable canning plant and the wholesale vegetable shipper.

Buying from farmers involved mostly eggs and vegetables. Much of the buying from farmers was on a contract basis with the farmers agreeing to furnish specified amounts of the product at certain intervals. Eggs sold by farmers to food retailers were usually sold in case lots, not by the 4 or 5 dozens as was often common in less industrialized areas.

POSSIBILITIES FOR INCREASED BENEFITS FROM INDUSTRY TO LOCAL FARMERS

Jones County families spent $188 per capita for food during the year 1953-54, according to estimates from survey data obtained in May, 1954. This means big business for farmers and food handlers.

Local farmers, it was shown, get a great deal of this business. They might get even more by increased coordination with other groups including joint long-time planning.

Greater coordination means more working together of food retailers and farmers, of food retailers and home economists, of food processors and home economists, of agriculturists, farmers, and food processors. Some suggestions for coordination are given.

Jones County consumers like a wide choice of foods in various forms. But the total amount of food that can be used by a particular family is limited. An increase in the use of one kind may lead to a decrease in the use of another. Retail grocers might well serve farmers by keeping them posted as to trends in sales of the various foods.

This survey shows that some Jones County farm families are moving to town; that some rural families are shifting from farm to non-farm work reducing production of food for family use. Many of these families are accustomed to eating what they produce and doing without when the home supply is used up. Home economists working with retailers can be of assistance to such families.

Then, milk plants and home economists might join forces in expanding the use of milk and its products. Nearly **one half** the urban families and nearly **one third** the rural families in the Jones County survey had dairy products in amounts lower than recommended by nutrition specialists for families of their size and composition. One in four urban families and one in ten rural families had large shortages of these protective foods, that is 50 percent or less than recommended amounts.

Growers of vegetables (both for the fresh and canning market) need to work closely with market operators to produce varieties and quantities demanded. These are in need of continual help from the agriculturist for methods and techniques of furnishing kinds of vegetables the market wants.

Industrialization can be of greater assistance to farmers when there is long-time planning with food handlers and other leaders in the County. Industrialization is bringing about a decrease in number of farmers and an increase in incomes. More families depend on purchase for their food supply. All this opens up possibilities for those who continue farming; but there must be long-time planning.

The family survey showed that higher income families used increasing amounts of animal food products such as beef, pork, broilers, eggs, milk. Farmers may therefore take advantage of this favorable situation: (1) by plans for expanding livestock production to meet increasing demand for locally produced meat (both by retailers and by consumers purchasing for storage in home freezers and lockers); (2) by examining further the possibilities to be found in expanding broiler production.

There is also the possibility for expansion of vegetable production. Emphasis here would be on quality and variety demanded by the consumer. With such expansion additional marketing facilities for vegetables might be desirable.

SUMMARY

Data for this report were obtained in May, 1954 from a survey of 127 families in Laurel and 129 families in rural areas within a 10-mile radius of the City and from a third sample of the food stores in Laurel where the majority of Jones County families traded, at least in part.

Income per capita for Jones County families, based on incomes of urban and rural families in the survey during 1953-54, was $783.

Average per capita food expenditures for Jones County, based on expenditures of families in the survey, was $188.

When asked to name groceries where they traded, 34 percent of the rural families in the survey sample did not mention a Laurel grocery. The majority (73 percent) not mentioning a Laurel grocery were 8 or more miles away from this city.

The wife (or female head) was the person who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. But men in rural families engaged in this activity a little more frequently than men in urban families.

The majority of families included in the survey had bought none of the eight kinds of foods being studied (i.e., milk, beef, pork, broilers, eggs, sweet potatoes, tomatoes and leafy vegetables) directly from producers during the year preceding the interview. Eggs was the food most often purchased this way. Furthermore, there was no desire on the part of most consumers to buy from producers. Inconvenience was one of the important reasons given. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled.

A few families both urban and rural purchased beef, pork, broilers, from farmers to put in the home freezer or community locker. This practice may increase in the future provided consumers are satisfied with the quality of meat bought.

The majority of last purchases of each of the specified foods used by urban families were made at groceries in Laurel. This was not the case with last purchases by rural families. Last purchases of the most of foods were elsewhere, usually from a food store in rural areas of Jones County. There seem to be several reasons for this: (1) the traffic situation in Laurel; (2) money incomes from non-agricultural sources resulting in more and better stores in rural areas; (3) greater store loyalty of rural families.

A comparison of amounts spent for specified foods and foods that competed with them showed large expenditures for competing products. Jones County families like a variety in kinds and forms of food. Farmers need to study changes in kinds of foods sold at food stores in the County as a basis for planning farm production programs.

Most urban families and about one-third of the rural families depend largely on purchase for their food supply.

Most rural families who had shifted occupation from farm to non-farm had continued to produce for home consumption. But urban families who had shifted occupation from farm to non-farm had ceased production for home use.

When consumption of specified foods during May is compared with similar data during September, greatest seasonal variation was found in three meats and three vegetables. All of these except one (turnip greens by urban families) were used by a larger proportion of families in September.

Increases in the proportion of families purchasing from lower to higher income group were greatest for beef, whole milk, eggs, and tomatoes.

Principal reasons given for non-use of the specified foods were: (1) use of similar or other types of food; (2) financial; (3) dependence on home supply; (4) food not in season (or considered not in season); (5) this is a food never used, or very rarely used.

Much of the beef, broilers, eggs, milk, and vegetables when in season, handled by food retailers of Laurel was locally produced.

APPENDIX TABLES

Table 1. Yearly average employment, total payrolls, and average annual wage per worker in non-farm industries, Jones County, Mississippi, 1950-54.

Industry group	Average employment				
	1950	1951	1952	1953	1954
Manufacturing:					
Food products	286	285	319	353	402
Textiles	454	492	273	342	372
Apparel	569	588	626	660	597
Lumber and wood	990	1,435	1,140	967	1,097
Furniture	452	69	55	42	39
Pulp and paper	2,823	2,305	2,725	2,775	2,850
Printing	48	47	45	37	38
Chemicals	125	137	141	148	147
Petroleum	39	36	6	6	82
Leather products	—	10	13	7	4
Structural clay	39	41	37	42	67
Fab. metals	25	20	21	15	14
Machinery	116	141	132	159	163
Electric equipment	—	2	1	1	—
Total Manufacturing	5,966	5,608	5,534	5,554	5,872
Service industries	3,089	3,246	3,078	2,950	2,907
Total Non-farm	9,055	8,854	8,612	8,504	8,779

Industry group	Average annual wage paid per worker				
	1950	1951	1952	1953	1954
Manufacturing:					
Food products	$2,181	$2,210	$2,362	$2,409	$2,432
Textiles	2,094	2,260	2,031	2,365	2,272
Apparel	1,714	1,953	1,997	2,052	1,910
Lumber and wood	2,087	2,500	2,518	2,399	2,616
Furniture	3,206	2,349	2,515	2,704	2,395
Pulp and paper	2,954	3,444	3,351	3,597	3,866
Printing	3,328	3,501	3,655	4,062	4,368
Chemicals	2,323	2,802	2,518	2,874	3,079
Petroleum	3,716	3,685	4,011	4,291	3,470
Leather products	——	1,080	1,263	1,430	1,247
Structural clay	1,338	1,334	1,341	1,657	2,138
Fab. metals	1,794	2,063	1,906	2,142	2,230
Machinery	3,752	3,809	3,991	3,791	4,025
Electric equipment	——	1,031	6,600	3,500	——
Total Manufacturing	$2,603	$2,836	$2,870	$3,016	$3,181
Service industries	2,128	2,246	2,302	2,521	2,596
Total Non-farm	$2,441	$2,620	$2,667	$2,844	$2,987

Industry group	Total payrolls				
	1950	1951	1952	1953	1954
Manufacturing:					
Food products	$ 623,737	$ 629,715	$ 753,502	$ 850,520	$ 977,647
Textiles	950,593	1,111,946	554,372	808,872	845,111
Apparel	975,046	1,148,295	1,250,398	1,354,352	1,140,538
Lumber and wood	2,066,272	3,587,943	2,870,915	2,320,259	2,869,238
Furniture	1,449,271	162,069	138,334	113,557	93,391
Pulp and paper	8,338,638	7,938,511	9,131,864	9,982,429	11,010,792
Printing	159,760	164,537	164,481	150,292	165,981
Chemicals	290,326	383,899	355,109	425,373	452,569
Petroleum	144,923	132,677	24,067	25,744	284,541
Leather products	——	10,800	16,422	10,013	4,989
Structural clay	52,175	54,687	49,621	69,613	143,224
Fab. metals	44,856	41,261	40,022	32,123	31,219
Machinery	435,288	537,047	526,797	602,692	656,050
Electric equipment	——	2,062	6,600	3,500	6,000
Total Manufacturing	$15,530,885	$15,905,449	$15,882,504	$16,749,339	$18,681,290
Service industries	6,574,705	7,289,758	7,084,383	7,436,900	7,545,684
Total Non-farm	$22,105,590	$23,195,207	$22,966,887	$24,186,239	$26,226,974

Source: Computed from Mississippi Employment Security Commission Bulletins: **Monthly Employment and Quarterly Wages of Workers Covered by The Mississippi Employment Security Law, By Counties, By Industry, For the Calendar Years 1950-54.**

Table 2. Total and per capita expenditures for food through retail outlets, Jones County, Mississippi, 1944,54.

Year	Current dollars		1935-39 dollars*	
	Total	Per capita	Total	Per capita
1954	11,864,080	196	5,249,593	87
1953	11,757,095	197	5,202,254	87
1952	10,718,984	182	4,620,252	79
1951	10,678,537	184	4,704,201	81
1950	9,779,989	171	4,797,112	84
1949	7,867,799	139	3,894,950	69
1948	9,380,302	169	4,466,810	80
1947	8,868,818	162	4,571,556	83
1946	7,098,696	131	4,436,685	82
1945	5,995,075	113	4,313,002	81
1944	5,417,584	103	3,983,518	76

*Food sales adjusted to 1935-39 price level by applying BLS all foods price index to current expenditures.

Table 3. Volume of Taxable Retail Sales, by Industry Groups, Jones County, Miss., 1944-1954.

Year	Total Retail Sales	Food	Furniture and Fixtures	Apparel and General Merchandise	Automotive	Building and Materials	Miscellaneous Retail	All Other
				Dollars				
1954	48,447,182	11,864,080	2,677,154	8,528,155	8,965,499	7,291,132	5,723,693	3,397,467
1953	44,913,963	11,757,095	2,671,308	7,923,833	9,021,574	5,168,023	5,302,238	3,069,892
1952	45,092,837	10,718,984	2,512,382	8,097,281	9,481,810	6,521,290	4,872,736	2,888,354
1951	44,221,039	10,678,537	2,253,852	7,494,429	9,245,179	6,505,197	5,053,448	2,990,397
1950	43,548,896	9,779,989	2,281,977	7,900,902	10,106,319	6,462,925	5,796,560	1,220,224
1949	36,860,140	7,867,799	1,568,399	7,608,932	7,858,991	6,171,294	4,556,525	1,228,200
1948	42,372,121	9,380,302	1,672,102	9,177,945	8,022,792	8,392,508	4,205,214	1,521,748
1947	37,043,187	8,868,818	1,527,350	8,317,622	6,507,106	7,204,723	3,568,162	1,049,406
1946	30,701,559	7,098,696	1,411,502	7,769,786	4,974,287	5,688,358	3,758,930	—
1945	24,691,737	5,995,075	975,194	6,547,210	2,933,160	5,104,226	3,136,872	—
1944	19,400,889	5,417,584	736,466	5,620,831	2,494,948	2,510,400	2,607,638	13,022

Source: Mississippi State Tax Commission Service Bulletins Nos. 29. 31, 33. 35, 37, 39, 41, 43, 45, 46, and 49.

Table 4. Percentage of urban and rural families using specified foods from any of one or more sources (bought, home produced, gifts) and from purchase only by income groups during report week, May 1954.

Foods	Percent who used any from one or more sources								Percent who used bought only							
	Urban				Rural				Urban				Rural			
	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over
Cabbage	38	43	53	41	81	76	87	67	27	26	28	24	0	4	0	22
Mustard greens	12	17	28	11	31	8	20	7	8	9	25	4	0	4	0	0
Turnip greens	54	39	41	41	69	28	44	44	35	26	28	30	0	4	0	7
Beef roast	4	9	28	43	13	12	22	26	4	9	28	43	6	0	16	19
Hamburger	23	43	47	50	16	24	47	41	23	43	44	50	13	12	38	33
Beef steak	38	43	56	80	31	36	53	74	38	43	53	76	16	20	33	59
Bacon	50	78	72	83	56	56	78	85	50	78	72	80	53	32	64	70
Pork chops	12	30	25	33	3	12	11	26	12	30	25	33	3	0	7	19
Sausage	23	65	38	41	16	36	40	41	23	65	28	41	13	20	33	30
Ham	8	30	22	39	9	24	31	19	4	30	22	37	3	4	22	11
Salt pork	46	52	41	13	38	28	16	22	42	52	41	13	31	16	13	11
Broilers	58	70	78	85	66	40	76	85	58	65	75	85	9	8	29	52
Eggs	88	100	100	100	100	96	100	96	58	87	91	93	13	16	36	48
Whole milk	50	83	94	96	81	92	100	96	38	83	94	93	9	16	36	56
Buttermilk	65	61	50	50	84	72	71	74	50	57	47	46	6	12	18	41
Sweet potatoes	27	22	6	20	13	24	9	7	19	22	6	20	0	4	2	4
Fresh tomatoes	17	22	66	85	3	28	51	67	12	22	66	85	0	24	51	67
Total families	26	23	32	46	32	25	45	27	26	23	32	46	32	25	45	27

Table 5. Average amounts specified purchased foods used by urban and rural families using during report week, May 1954, by income groups.

	Urban families				Rural families			
Food	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over
Beef steak, lbs.	1.90	1.35	1.59	2.80	2.60	2.40	2.15	3.28
Beef roast, lbs.	1.50	2.25	2.67	3.45	2.50	0	2.64	3.00
Beef hamburger, lbs.	1.25	1.35	1.75	2.28	2.75	.75	1.93	2.11
Broilers, lbs.	2.83	2.77	3.32	3.94	2.08	1.75	2.81	4.11
Sausage, lbs.	1.08	1.07	1.50	1.50	1.25	2.30	1.70	2.02
Ham, lbs.	3.00	1.07	1.28	1.82	.50	.50	1.70	1.67
Salt pork, lbs.	1.16	1.42	1.69	1.08	1.70	1.50	1.33	.67
Bacon, lbs.	1.31	1.61	1.30	1.72	1.37	2.25	1.83	1.93
Pork chops, lbs.	1.17	1.36	1.22	1.77	2.00	0	1.17	1.35
Fresh tomatoes, lbs.	.58	1.35	2.63	2.90	0	3.58	3.00	3.78
Sweet potatoes, lbs.	2.90	2.10	7.00	2.56	0	2.00	3.00	1.00
Cabbage, lbs.	5.64	4.00	4.00	3.36	0	3.00	0	5.00
Mustard, lbs.	1.24	1.83	1.24	1.24	0	1.66	0	0
Turnip greens, lbs.	1.89	1.17	2.67	1.71	0	2.00	0	1.50
Whole milk, qts.	3.80	7.55	7.97	12.16	10.33	3.75	7.72	10.33
Buttermilk, qts.	3.46	2.31	2.03	2.57	2.00	4.33	2.12	3.09
Eggs, doz.	1.27	1.78	2.16	2.72	1.02	2.88	2.28	2.44
No. families	26	23	32	46	32	25	45	27

Table 6. Average amount specified foods used (all sources) by urban and rural families using during report week.

	Urban families				Rural families			
Food	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over
Cabbage, lbs.	5.90	4.20	5.47	4.03	6.52	9.32	7.29	6.17
Mustard greens, lbs.	1.16	1.62	1.84	1.33	2.98	3.32	2.58	1.24
Turnip greens, lbs.	1.78	1.44	2.85	1.74	2.98	2.43	2.18	2.08
Beef roast, lbs.	1.50	2.25	2.67	3.45	2.25	3.00	2.65	2.86
Hamburger beef, lbs.	1.25	1.35	1.70	2.28	2.80	.96	1.80	2.00
Beef steak, lbs.	1.90	1.35	1.83	2.83	2.35	2.72	2.28	3.07
Bacon, lbs.	1.31	1.61	1.30	1.72	1.40	2.02	1.81	1.84
Pork chops, lbs.	1.17	1.36	1.22	1.77	2.00	2.67	1.10	1.68
Sausage, lbs.	1.08	1.07	1.50	1.50	1.40	2.56	1.82	2.02
Ham, lbs.	3.50	1.07	1.28	1.83	1.50	1.58	2.04	3.40
Salt pork, lbs.	1.10	1.42	1.69	1.08	1.83	1.04	1.43	.75
Broilers, lbs.	2.83	2.72	3.27	3.94	3.89	3.35	3.28	4.02
Eggs, doz.	1.26	1.76	2.25	2.62	1.47	2.15	2.44	2.67
Whole milk, qts.	6.15	7.55	9.77	12.36	14.85	14.35	16.22	12.00
Buttermilk, qts.	4.47	2.29	2.22	2.74	7.22	7.22	4.23	4.60
Sweet potatoes, lbs.	2.50	2.10	7.00	2.56	7.50	4.83	2.50	1.50
Fresh tomatoes, lbs.	.69	1.35	2.63	2.90	1.00	3.21	3.00	3.78
Number families	26	23	32	46	32	25	45	27

Table 7. Reasons most often given by homemakers for non-use of specified foods during report week, May 1954 (listed in order of importance).

Food	Urban	Rural
Whole milk	Don't drink. No money. Too expensive.	Don't drink. Used or liked a competing dairy product. Cows dry. No money.
Buttermilk	Used a competing dairy product. Never use.	Used a competing dairy product. Never use.
Broilers	Used other kinds of meats. Costs too much. Can't afford.	Used other kinds of meats. Home supply not ready.
Eggs (few did not use)	Too high. Cannot afford.	Hen's didn't lay.
Ham	Costs too much. Can't afford. Used other kinds of meat.	Used other kinds of meats. Can't afford. Haven't any money.
Pork chops	Used other kinds of meats and cuts. Indigestible. Can't eat. Not in season.	Used other kinds of meats. Costs too much. Not in season. Use when kill hogs.
Bacon	Used other meats or cuts. Use occasionally only.	Used other kinds of meats. Never use. Used occasionally only.
Sausage	Used other kinds of meats. Not good for one. Not digestible.	Used other kinds of meat. Used after kill hogs only.
Fresh tomatoes	Too high. Can't afford. Used other kinds of vegetables.	Home supply not ripe. Too expensive.
Cabbage	Used other vegetables. Don't like so much. Used occasionally only.	Used other kinds of vegetables. Don't like so much. Use once in a while.
Turnip greens	Used other vegetables. Don't like so much.	Used other vegetables. Tired of turnip greens. Poor quality of greens now.
Beef steak	Can't afford. Costs too much. Used other meats or cuts.	Used other meats or cuts. Costs too much.
Beef roast	Used other meats or cuts. Costs too much.	Used other meats or cuts. Costs too much.
Beef hamburger	Used other meats or cuts. Costs too much. Can't afford.	Used other meats or cuts. Can't afford. Costs too much.
Mustard greens	Used other kinds of vegetables. Don't like so much.	Used other kinds of vegetables. Out of season. Tired of mustard greens.
Sweet potatoes	Used other vegetables. Too expensive. Not in season.	Home supply used up. Not in season now.

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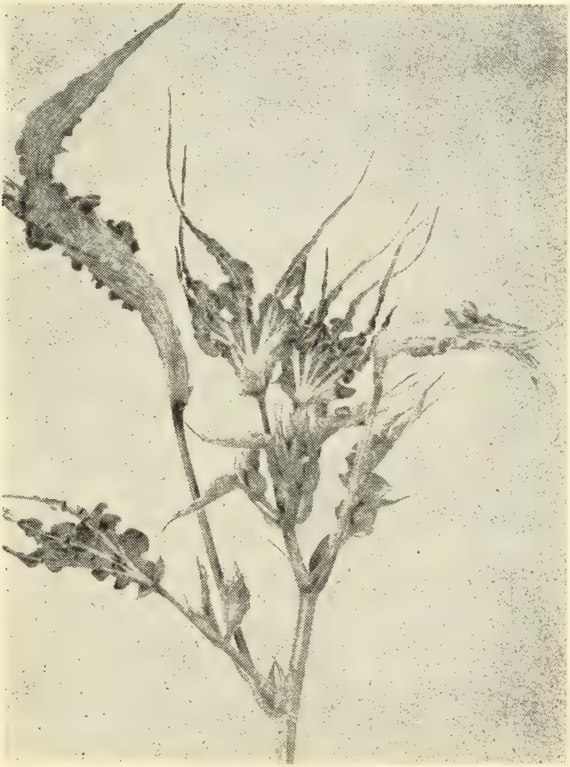
no 541

BULLETIN 541 APRIL, 1956

RESPONSES OF COTTON TO 2, 4-D



MISSISSIPPI STATE COLLEGE

AGRICULTURAL EXPERIMENT STATION

CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

1956
PPI STATE COLL

SUMMARY

The effect of 2,4-D on cotton plant growth, yield, fiber and seed properties were investigated in a series of five separate tests during a period extending from 1950 to 1953. Applications of 2,4-D ranging from 0.001 to 0.1 lb. per acre were made to cotton plants representing four general stages of plant development. They were designated as seedling, square, blossom and boll stages.

When treatments were made at the seedling stage, applications of 0.001 lb. per acre reduced earliness from 17 to 44 percent and had little to no effect on yield. Application of 0.01 lb. per acre reduced earliness (75 to 83 percent) and yield (35 to 46 percent). Both yield and earliness were markedly reduced (90 to 85 percent) by 0.1 lb. per acre.

When treatments were made at the squaring stage, applications of 0.001 lb. per acre had no clear-cut effect on either yield or earliness. Application of 0.01 lb. per acre reduced yield (27 to 74 percent) and earliness (7 to 45 percent). Applications of 0.1 lb. per acre markedly reduced yield (68 to 96 percent) and earliness (55 percent).

When treatments were made at the blossoming stage, applications of 0.001 and 0.01 lb. per acre had little to no effect on yield or earliness. Applications of 0.1 lb. per acre reduced yield (13 to 65 percent) and earliness (33 percent).

The boll stage was found to be most resistant to effects of 2,4-D on the characters measured.

Yield reductions caused by death and subsequent desiccation of blossoms were observed.

RESPONSES OF COTTON TO 2,4-D

By

Harry Carns[1] and V. H. Goodman[2]

INTRODUCTION

As recent as the introduction of 2,4-D has been to American farming it is doubtful whether it would be economical in some areas to produce crops such as rice and certain other small grains, if 2,4-D were suddenly removed from the market. The importance of 2,4-D and similar herbicides cannot be over-estimated. The full potentialities of the use of systemic herbicides have not been realized, as much less than half the farms in the United States use any form of chemical weed control. While 2,4-D is used in the production of many crops, in the clearing of the land for cultivation, in the maintenance of rights-of-way for highways, railways, and powerlines, in the maintenance of lawns and golf courses, and around industrial plants to reduce the weed problems, yet this very useful agricultural chemical, because of the very properties that make it so useful, may severely damage certain susceptible crops growing in the vicinity of the herbicidal application. This is especially true of our chief fiber crop, cotton, which is one of the cultivated plants most susceptible to 2,4-D.

Contamination of cotton with 2,4-D has occurred in a variety of ways. The most common ones are use of the same spray rig both for 2,4-D and cotton insecticides, drift of 2,4-D sprays from rights-of-way or adjacent fields due to careless applications, contamination of pesticides and other agricultural chemicals with 2,4-D, and improper labelling or storage of the herbicide after purchase by the consumer.

Beginning in 1950 at the Delta Branch Experiment Station, Stoneville, Miss. and in 1951 at State College, Mississippi, investigations were initiated to study the relationship between 2,4-D contamination and the yield of cotton at various stages of growth. The work was undertaken in an effort to develop a basis for evaluating the damage done to a cotton crop by the inadvertent contamination with this material.

METHODS

Spray Methods. Methods of spraying varied at the two locations although the relative amounts of material applied were approximately the same per acre basis. At State College the 2,4-D was applied at the rates of 0.001, 0.01, and 0.1 pound per acre while at Stoneville the material was applied at the rates of 0.001, 0.002, 0.005, and 0.01 pound per acre. At State College, the quantity of 2,4-D required per plot was dissolved in water with a surface-active agent, and the solution was applied at the equivalent of 20 gallons per acre. The entire quantity was applied on each plot. At the Delta Station, applications were made with a conventional two-row spray rig with one nozzle per row and delivering liquid at the rate of one gallon per acre. Plots at the Delta Station consisted of four, fifty foot rows; treatments were in triplicate. At State College each plot was a single, twenty foot row and each treatment was replicated four times.

Stages of Treatment. Applications of 2,4-D were made as a foliage spray to cotton at four stages of plant development, and these stages are designated as the seedling, square, blossom and boll stages.

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Seedling stage treatments were made 3½ to 4 weeks after planting. At the time of treatment the plants had from three to six foliage leaves and were from four to eight inches tall. At this time the plants showed no evidence of square formation nor were any lateral branches visible. This is the only stage of treatment that exactly coincided between experiments conducted at State College, and at the Delta Station.

Square stage treatments were made at State College six weeks after planting and the plants at this time had initiated the first floral structure. There were squares present but no flowers or bolls. The plants had eight to thirteen foliage leaves, two to eight squares, and the plants were eleven to fourteen inches high. The square stage treatments at Delta Station were made at a stage of maturity slightly older than this, with eight or more squares per plant, but prior to the production of the first flower, and plants were from twelve to eighteen inches tall.

Blossom stage treatments at State College were made eight weeks after planting. On the average the cotton plants at this time were 18 to 27 inches tall, had 10 to 14 foilage leaves, 6 to 20 squares and had one small boll per plant. The treatments at the Delta Station were made as the plants were approaching the flowering peaks. Several bolls were present per plant. Plants were 24 to 36 inches tall.

Boll stage treatments were made at State College thirteen weeks after planting and about two to three weeks before the first picking. The plants had ceased to produce squares and flowers and many of the more mature bolls had started to open. Growth in height had also ceased. The plants were 36 to 40 inches tall. Boll stage treatments were not made at the Delta Station.

RESULTS

Yield. Significant reductions in yield of field grown cotton where 2,4-D has been applied to the foliage have been reported by various workers (1,3,4,5,8). Epps (5) states that serious reductions in yield were found to occur from applications of 0.01 pound per acre. Baskin (2) reports significant reductions from as little as 0.0024 pounds per acre using drenching sprays. He further notes that the greatest reduction in yield occurred when the material was applied at the flowering stage.

The results of yield measurements from a total of five yearly observations made at State College and at the Delta Station are shown in Tables 1 and 2. Dosages less than 0.002 pounds per acre did not appear to have adversely affected yield. As the rate increased, significant decreases in yield were encountered. The data suggest that the yield response is not only associated with rate but is also a function of environmental conditions and the stage of maturity of the plant, with the earlier stages being the more susceptible.

Table 1. The effect of various concentrations of 2,4-D and stage of plant growth on cotton yield. Stoneville, Mississippi.

Year	2,4-D Lb./Acre	Yield - Lbs. Seed Cotton Per Acre Stage of Plant Growth		
		Seedling	Square	Flower
1950	0	1801		
	.001	1779	1627	1858
	.002	1417	1564	1848
	.005	1320	975	
	.01	1180	538	
1951	0	831	945	804
	.001	796	893	947
	.002	644	766	766
	.005	674	523	727
	.01	470	244	910

L.S.D. .01 408 lbs.
.05 305 lbs.

Table 2. The effect of various concentrations of 2,4-D and stage of plant growth on cotton yield. State College, Mississippi.

Year	2,4-D Lb./Acre	Yield - Lbs. Seed Cotton Per Acre Stage of Plant Growth			
		Seedling	Square	Blossom	Boll
1951	0	1177	1160	1101	1014
	.1	56**	24**	296**	931
1952	0	2302	1977	1762	1714
	.001	1926	1868	2062	1977
	.01	1320*	1450*	1852	1785
	.1	313**	640**	624*	1530
1953	0	1924	1839	1702	1648
	.001	1978	1624	1738	1440
	.01	1042*	612*	1120	1505
	.1	186**	72**	1482	1072

*Significant at the 5% level.
**Significant at the 1% level.

Earlier observations made at State College (8) led to the belief that the seedling stage was most susceptible to 2,4-D. However, a summary of the five years' observations at the two locations now lead to the conclusion that contamination at the square stage may be expected to result in as great or greater reduction in yield.

Treated at the seedling and square stages, cotton plants had distinctive appearances at the different rates of application of 2,4-D. When treated with 2,4-D at the rate of 0.1 pound per acre, the leaves of the plants showed a severe epinastic response and the stem tips were twisted the next day. Later on, the same plants were inhibited in growth and remained stunted for several weeks (Figures 1, 2, 3). Treated at the rate of 0.01 lbs. per acre, the appearance of the plants on the day after treatment was similar but not as severe as the symptoms at the higher rate. In the weeks following treatment at the 0.01 lb. per acre rate, the plants branched profusely, and developed many severely malformed, strap shaped leaves which gave the plants a distinctive appearance from long distances (Figures 4, 5, 6). Treatments at the rate of 0.001 lb. per acre induced no symptoms immediately after treatment but in the weeks following some malformed leaves were produced (Figures 7, 8, 9). At this low rate of treatment, growth was not inhibited and the plants grew as tall and sometimes taller than the untreated plants. Figures 10, 11, and 12 show untreated plants of the same age as those in the previous figures.

The experiments conducted at State College and at the Delta Station have been primarily concerned with 2,4-D contamination at low rates such as may result from spray drift. Direct applications with higher rates of 2,4-D than are discussed in this paper may result in further yield reductions even if applied to nearly mature cotton.

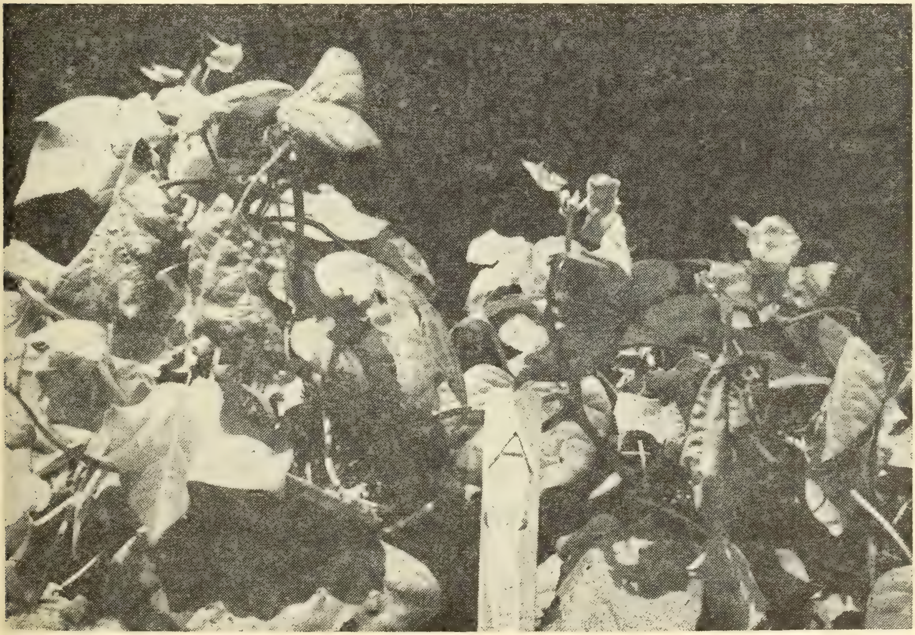

Figure 1. Cotton plants treated with 0.1 lb. per acre 2,4-D at the squaring stage, one week after treatment.

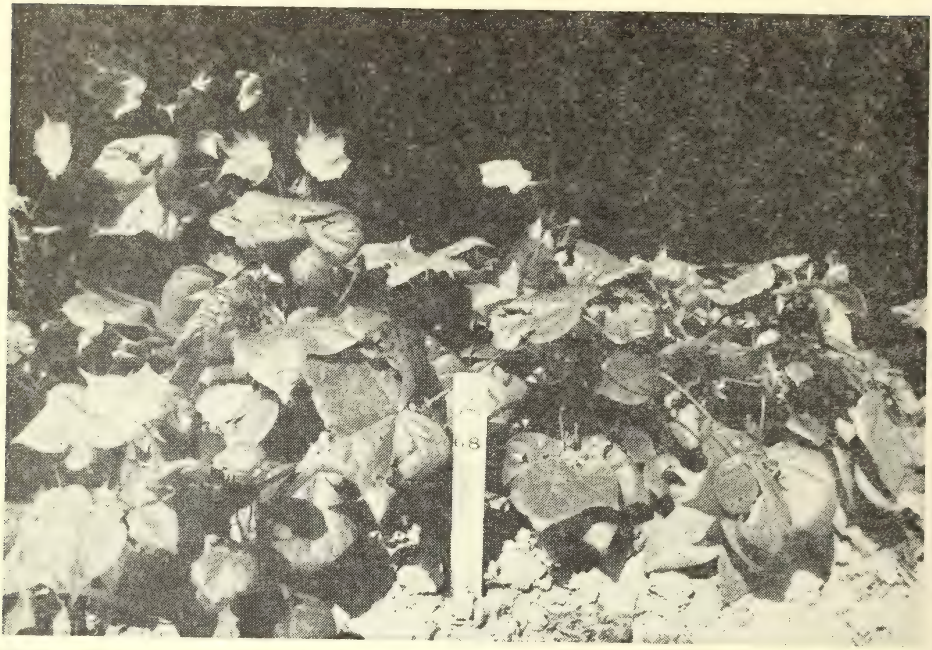

Figure 2. Cotton plants treated with 0.1 lb. per acre 2,4-D at the squaring stage, three weeks after treatment. Growth of the plants has been drastically curtailed.

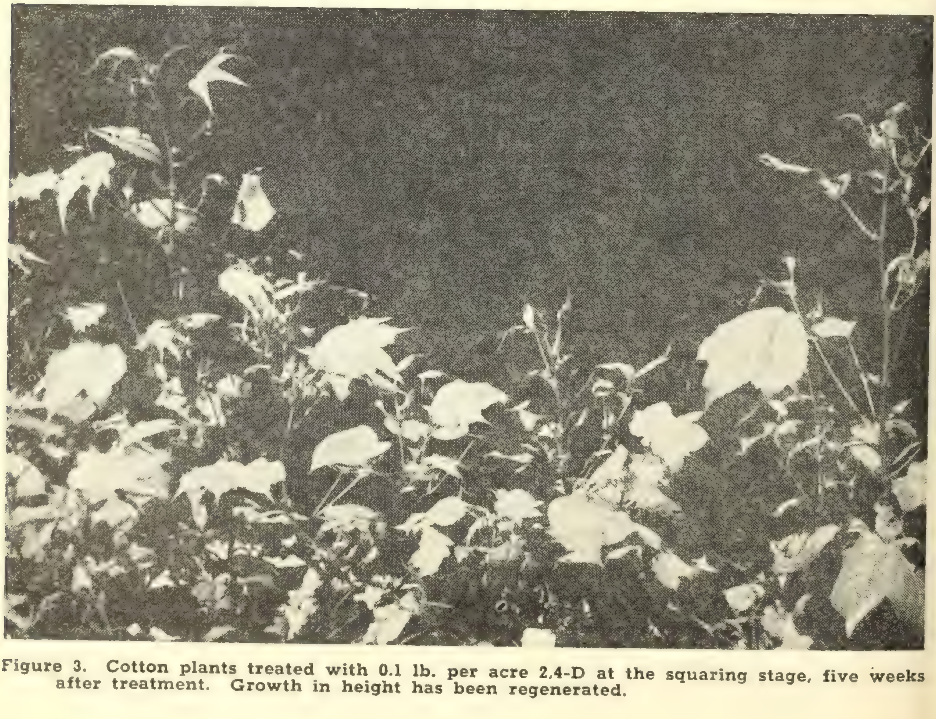

Figure 3. Cotton plants treated with 0.1 lb. per acre 2,4-D at the squaring stage, five weeks after treatment. Growth in height has been regenerated.

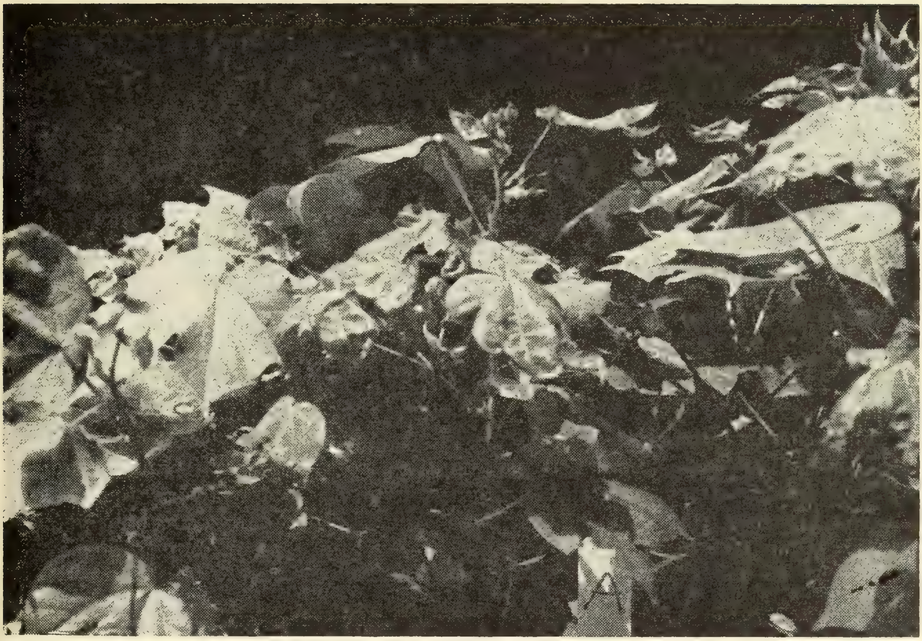

Figure 4. Cotton plants treated with 0.01 lb. per acre 2,4-D at the squaring stage, one week after treatment.

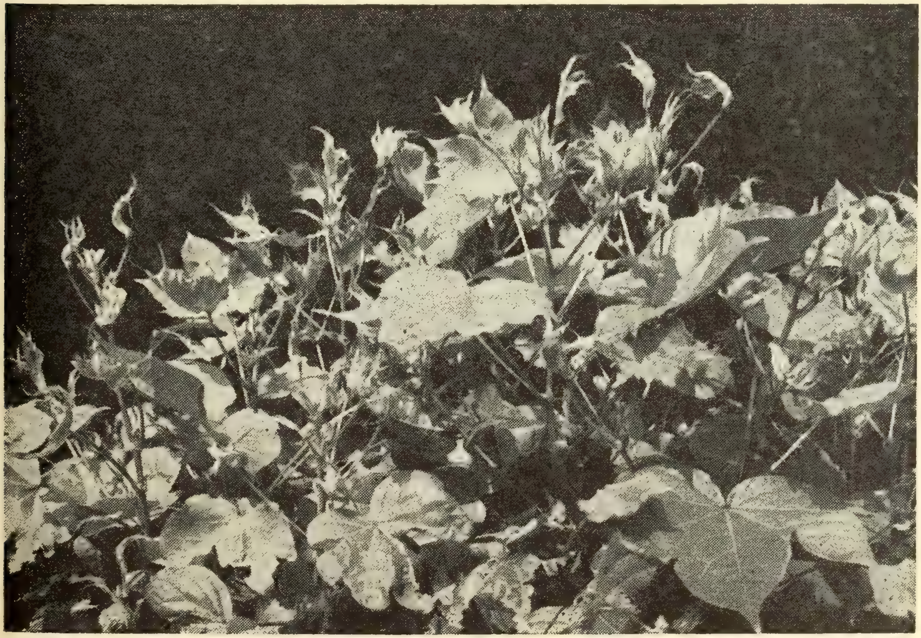

Figure 5. Cotton plants treated with 0.01 lb. per acre 2,4-D at the squaring stage, three weeks after treatment.

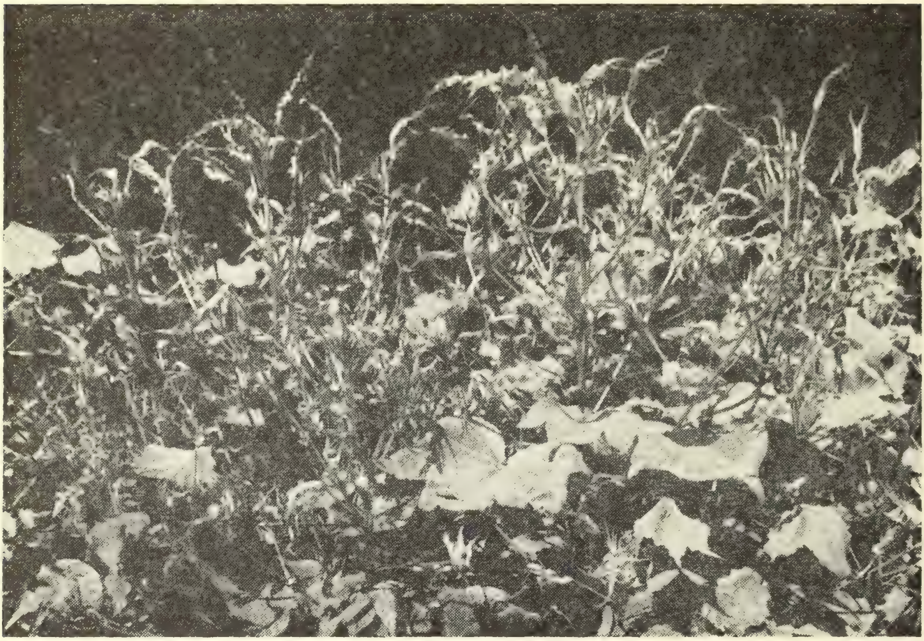

Figure 6. Cotton plants treated with 0.01 lb. per acre 2,4-D at the squaring stage, five weeks after treatment.

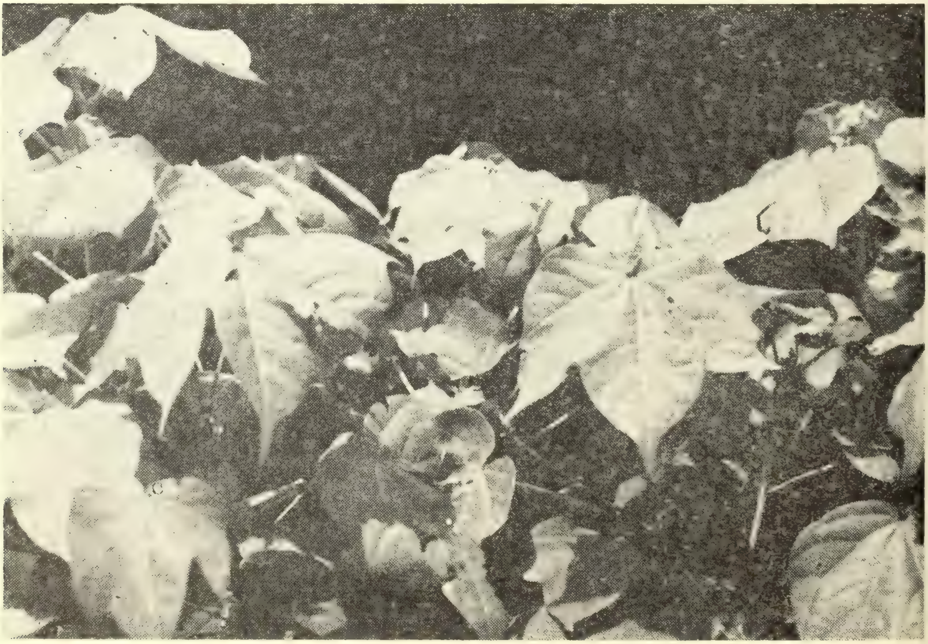

Figure 7. Cotton plants treated with 0.001 lb. per acre 2,4-D at the squaring stage, one week after treatment.

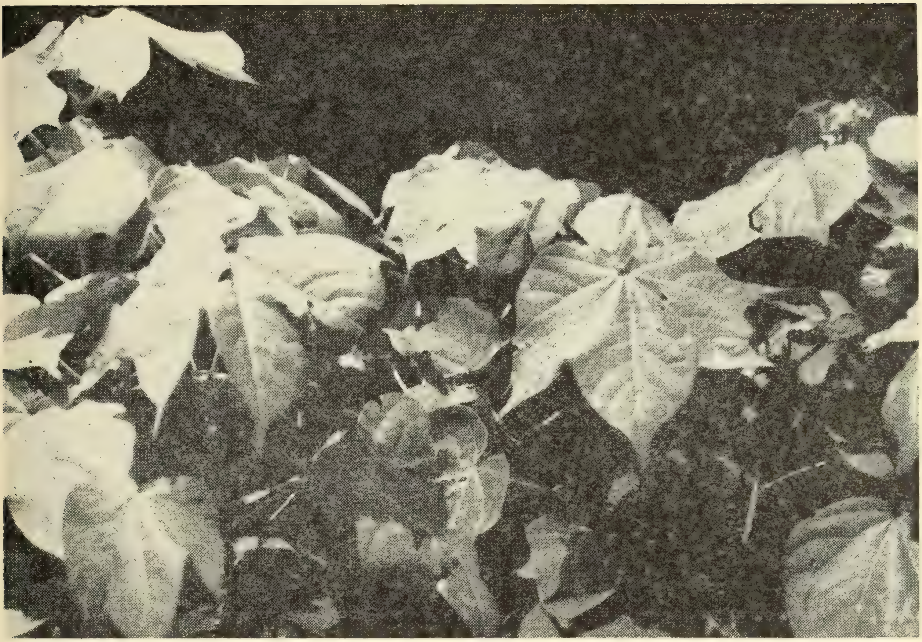

Figure 8. Cotton plants treated with 0.001 lb. per acre 2,4-D at the squaring stage, three weeks after treatment.

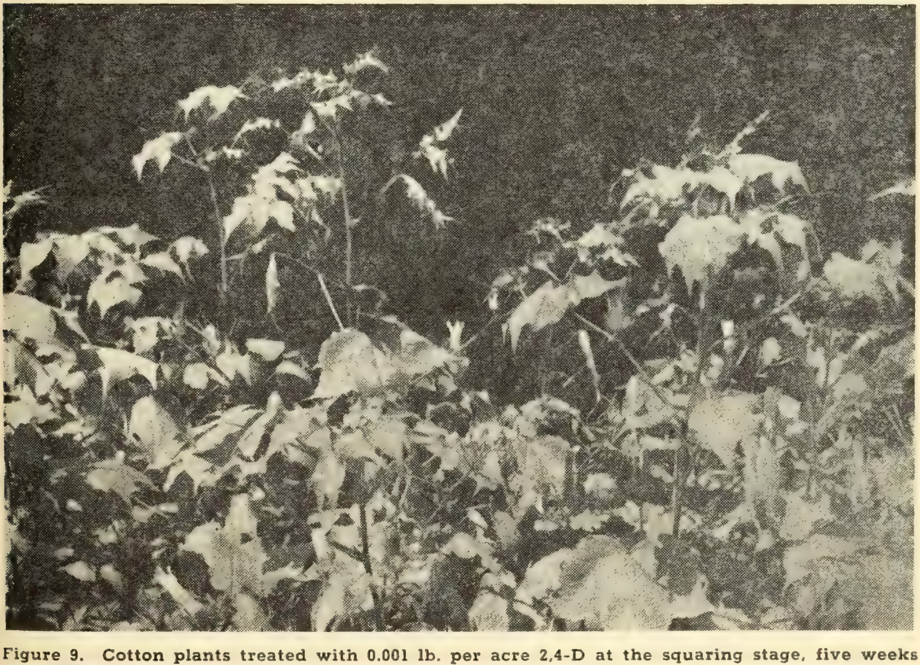

Figure 9. Cotton plants treated with 0.001 lb. per acre 2,4-D at the squaring stage, five weeks after treatment.

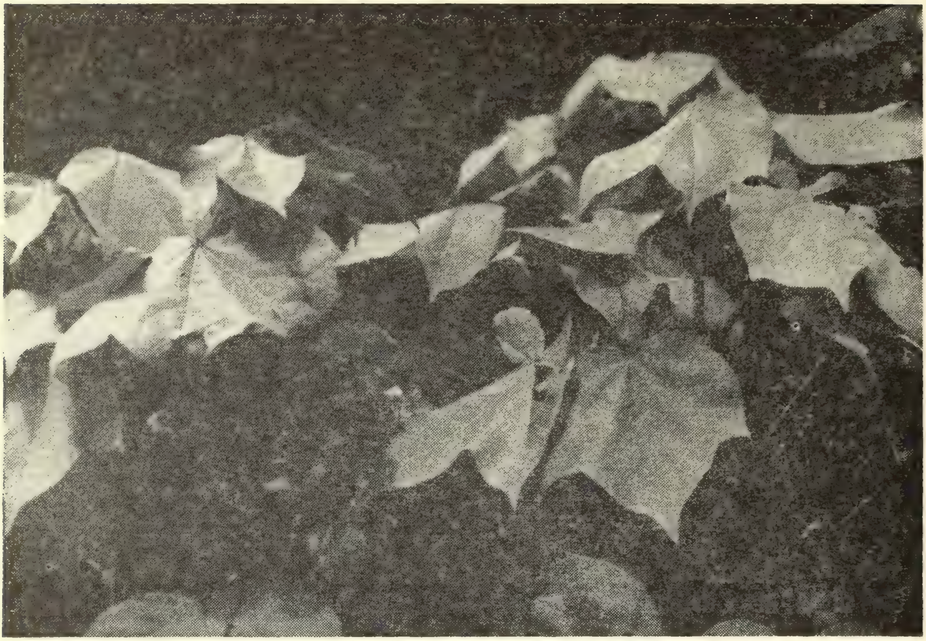

Figure 10. Cotton plants in untreated check plots one week after 2,4-D was applied to treated plots at the squaring stage.

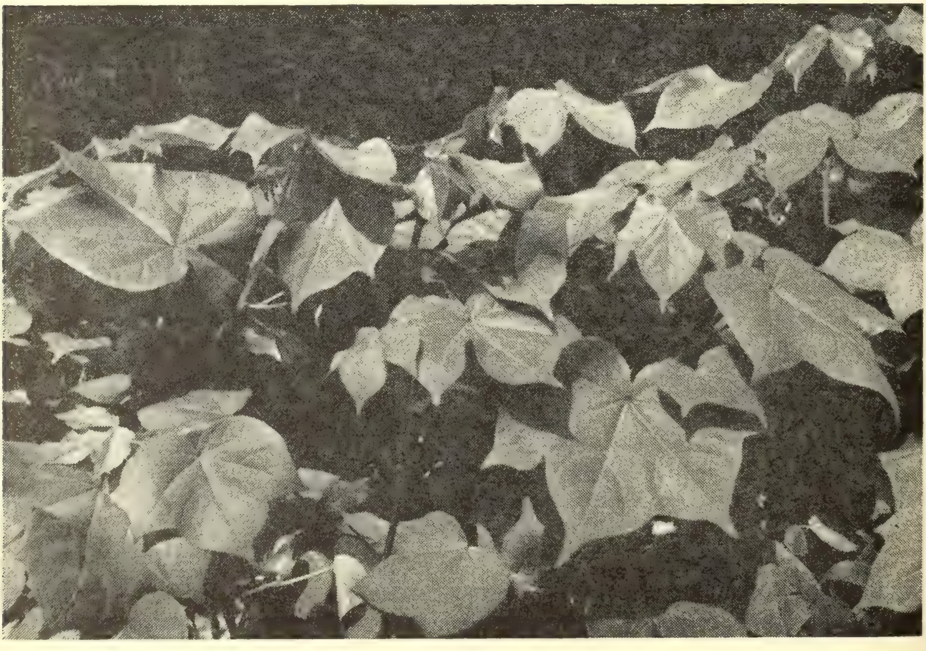

Figure 11. Cotton plants in untreated check plots three weeks after 2,4-D was applied to treated plots at the squaring stage.

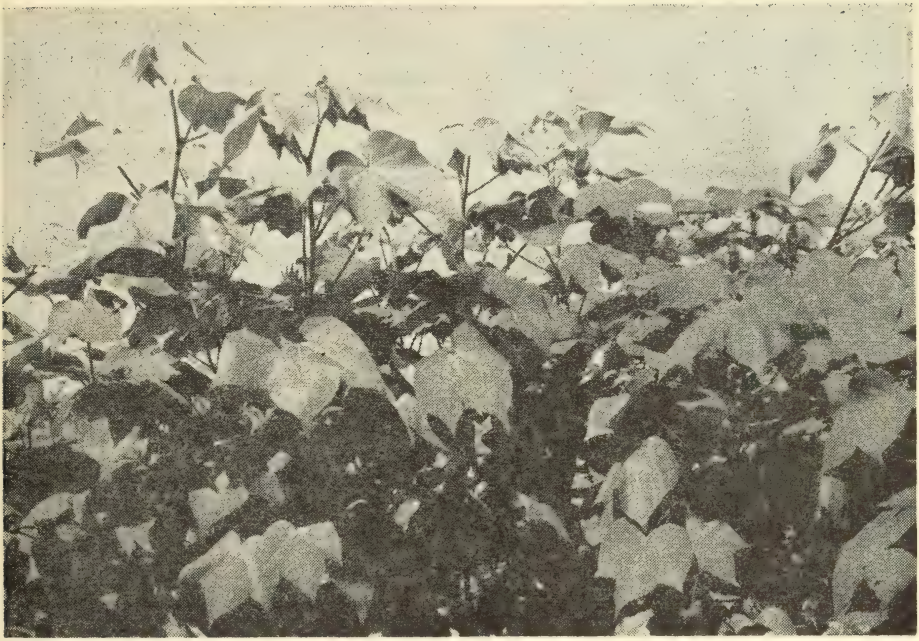

Figure 12. Cotton plants in untreated check plots five weeks after 2,4-D was applied to treated plots at the squaring stage.

Effect of 2,4-D on the Earliness of Cotton. Contamination of cotton with 2,4-D not only reduces the yield, but may also delay the time of maturity of the cotton crop (3, 4, 5, 6, 8). Tables 3 and 4 show the amount of seed cotton obtained on the first picking as a percent of the total yield for a particular treatment with 2,4-D. The relative amount of seed cotton obtained on the first and second picking varied depending on the times arbitrarily selected for picking, nevertheless, the percent of cotton in the first picking reflects the effect of treatments on maturity at time of harvest.

At both locations, the effect of 2,4-D on maturity was found to be greatest when applied at the seedling stage. At Stoneville, contamination at the seedling stage with 2,4-D severe enough to cause a yield less than 75 percent of uncontaminated plants was found to significantly delay maturity (Table 3). Similar results for the seedling stage are reported from State College (Table 4). At State College treatments at the square stages at a rate of 0.1 lb. per acre also produced a significant delay in maturity.

This delay, associated with 2,4-D contamination early in the season, appear-

Table 3. The effect of various concentrations of 2,4-D and stage of plant growth on earliness. Stoneville, Mississippi.

2,4-D	Earliness—As Percent of Seed Cotton in First Picking Stage of Plant Growth		
Lb./Acre	Seedling	Square	Blossom
0	41		
0.001	23	39	39
0.002	32	42	39
0.005	15	41	
0.01	10	38	

L.S.D. .01 19.8

Table 4. The effect of various concentrations of 2,4-D and stage of plant growth on earliness. State College, Mississippi.

2,4-D	Earliness—As Percent of Seed Cotton in First Picking Stage of Plant Growth			
Lb./Acre	Seedling	Square	Blossom	Boll
0	58			
0.001	48	71	50	43
0.01	10	32	55	56
0.1	9	26	39	51

L.S.D. .01 23.5

ed to be due to an inability of early squares and blooms on the contaminated plants to form mature bolls rather than to a reduction in total number of squares and blooms produced. This is borne out by the results shown in Table 5 where the total number of squares formed per plant is shown in relation to the concentration of 2,4-D applied and to the maturity of the plants at the time of application. There was no statistically significant difference in either 1950 or 1951 in the total number of squares formed per plant regardless of treatment, nor was there any significant variation observed in the rapidity at which the squares were formed. That the reduction in yield encountered was actually a function of the abscission of squares, blooms, and bolls is indicated by the data presented in Table 6.

Squares of ten plants per plot were tagged daily with dated tags as they became visible and a record was maintained of those squares forming mature bolls. The data show that the percent of squares forming mature bolls was reduced roughly in proportion to the severity of yield reduction resulting from the 2,4-D application.

Table 5. The effect of various concentrations of 2,4-D and stage of plant growth on square production. Stoneville, Mississippi.

2,4-D	Number of Squares Per Plant Stage of Plant Growth					
Lbs./Acre	Seedling		Square		Flower	
	1950	1951	1950	1951	1950	1951
0	43.6	20.6		21.9		31.6
0.001	43.7	32.0	41.6	27.2	42.7	20.4
0.002	57.7	33.8	51.9	19.2	31.7	21.5
0.005	43.9	39.9	49.6	24.7		28.1
0.01	41.7	32.8	56.7	29.9		24.4

N.S.D.

Table 6. The effect of various concentrations of 2,4-D and stage of plant growth on squares forming mature bolls. Stoneville, Mississippi, 1951.

2,4-D	Percent of Squares Forming Mature Bolls Stage of Plant Growth		
Lbs./Acre	Seedling	Square	Flower
0	24.1		
0.001	26.7	19.4	28.5
0.002	19.2	21.5	29.6
0.005	23.9	18.9	
0.01	21.1	9.8	

L.S.D. 0.01 5.7

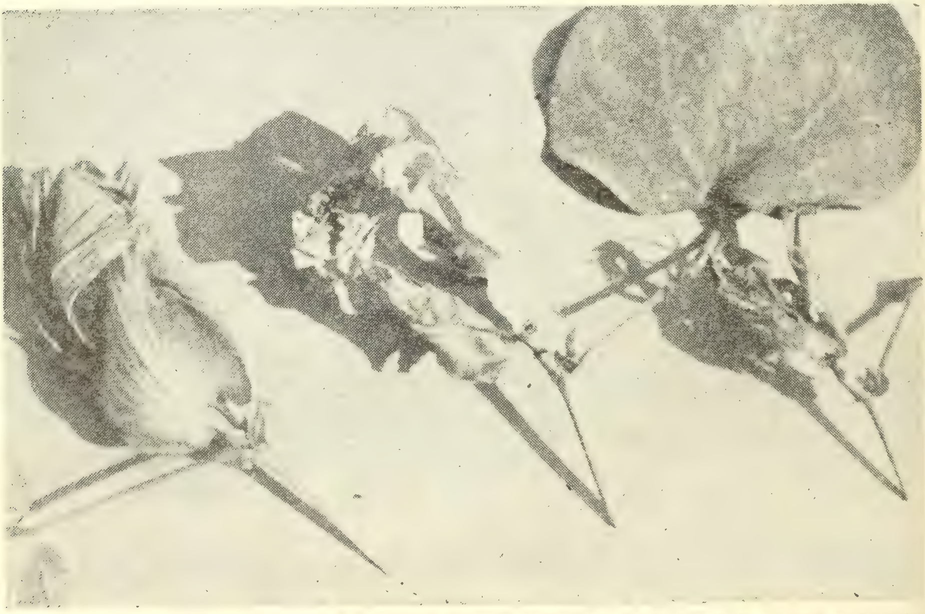

Figure 13. Desiccation of blossoms observed when treated plants are grown at low soil moisture. The two blossoms at the right of the picture show the characteristic response with the desiccation extending down the pedicel beyond the abscission zone. The blossom at the left is normal.

If conditions had been favorable for continued growth later into the fall, it is possible that additional increments in yield could have been obtained from some of the affected plots. This is particularly true of the plots treated at an early stage which had light yields since they were still growing vigorously at the time of the second picking while the untreated check plants were fully mature and showed considerable natural defoliation.

Effect of 2,4-D on the Germination of Seed, Progeny Seedlings and Fiber from Plants Treated with 2,4-D. It was desired to investigate the possible effect of 2,4-D on germination of a seed sample representing the entire crop harvested from the various 2,4-D treated plots incorporated in the experiment at the Stoneville location. Accordingly, seed samples were taken without regard to boll age and selected by continued mixing and halving the entire seed collected from the plots until an adequate sized sample was obtained. Results are shown in Table 7 for concentrations up to 0.01 pound per acre. No evidence of affect on seedlings and no significant decrease in germination over the untreated controls was observed. The data therefore suggest that, although it has been demonstrated by McIlrath, et al (9) and Goodman (7) that under certain conditions the 2,4-D stimulus is transmitted to the seed, within the concentration ranges studied above, the overall germ inability of the seed from fields showing similar 2,4-D damage will not be materially affected. It should be stressed that where evidence of damage is more severe than those here considered, the above may not be expected to hold true. Moreover, if contamination with 2,4-D occurs while there are many small bolls on the plants, germination and vigor of the seedlings may be impaired while the parental plants may show less gross morphological modifications than plants contaminated at the seedling, square or blossom stages.

Table 7. The effect of various concentrations of 2,4-D and stage of plant growth on germination. Stoneville, Mississippi.

2,4-D	Percent Germination Stage of Plant Growth					
Lbs./Acre	Seedling		Square		Flower	
	1950	1951	1950	1951	1950	1951
0	90.0	86.8		91.5		88.3
0.001	92.0	82.1	89.5	83.5	86.0	87.6
0.002	86.0	87.0	93.5	92.3	87.0	87.8
0.005	90.0	83.0	82.7	86.6		92.3
0.01	99.0	86.5	80.0	80.8		87.0

N.S.D.

Similar studies were undertaken to measure the effect of 2,4-D applications on lint index, fiber length, fiber strength, and fiber fineness in order to determine whether within the limits of the test, the applications of 2,4-D would materially affect other lint characteristics. Results of these determinations are shown in Tables 8 through 11. An examination of the results of these tests indicates that no general reduction in lint quality would be expected within the range of injury symptoms measured at the Delta Station. Studies made at State College tend to corroborate these results.

Table 8. The effect of various concentrations of 2,4-D and stage of plant growth on lint index. Stoneville, Mississippi.

	2,4-D	Lint Index Stage of Plant Growth		
Year	Lbs./Acre	Seedling	Square	Flower
1950	0	8.59	8.59	
	0.001	8.03	8.73	
	0.002	8.45	8.84	
	0.005	8.12	8.93	
	0.01	7.68	9.03	
1951	0	7.66	7.18	7.24
	0.001	7.46	7.51	7.70
	0.002	6.91	6.71	7.39
	0.005	6.99	7.41	7.32
	0.01	7.50	7.66	7.33

N.S.D.

Table 9. The effect of various concentrations of 2,4-D and stage of plant growth on fiber length. Stoneville, Mississippi.

	2,4-D	Mean Fiber Length Stage of Plant Growth		
Year	Lbs./Acre	Seedling	Square	Flower
1950	0	0.96		
	0.001	0.98	1.00	
	0.002	0.97	0.99	
	0.005	0.97	0.93	
	0.01	1.00	0.93	
1951	0	0.83	0.84	0.85
	0.001	0.83	0.88	0.85
	0.002	0.81	0.86	0.83
	0.005	0.88	0.87	0.85
	0.01	0.81	0.85	0.83

N.S.D.

Table 10. The effect of various concentrations of 2,4-D and stage of plant growth on fiber strength. Stoneville, Mississippi.

Year	2,4-D Lbs./Acre	Fiber Strength-Pressley Index Stage of Plant Growth Seedling	Square	Flower
1950	0	7.36	7.36	
	0.001	7.03	7.17	
	0.002	7.02	7.25	
	0.005	7.11	6.93	
	0.01	7.00	6.98	
1951	0	7.59	7.52	8.00
	0.001	7.84	7.85	7.65
	0.002	7.73	7.71	8.03
	0.005	7.57	7.58	7.58
	0.01	7.32	8.16	7.97

N.S.D.

Table 11. The effect of various concentrations of 2,4-D and stage of plant growth on fiber fineness. Stoneville, Mississippi.

		Fineness Stage of Plant Growth					
Year	2,4-D Lbs./Acre	Seedling		Square		Flower	
		A	D	A	D	A	D
1950	0	444	46	444	46		
	0.001	449	47	442	38		
	0.002	441	47	436	43		
	0.005	427	37	430	38		
	0.01	436	41	425	38		
1951	0	452	35	455	38	457	34
	0.001	449	34	456	34	462	40
	0.002	460	41	440	30	452	36
	0.005	447	48	486	40	436	31
	0.01	492	44	487	55	415	28

N.S.D.

Relative Susceptibility of Cotton at Different Stages of Contamination. The relative susceptibility of cotton to 2,4-D as indicated by the preceding results, might be summarized as follows: Square stage, most susceptibility from the viewpoint of final yield; seedling stage, very susceptible in terms of yield, but slightly less susceptible than the square stage; blossom stage, almost as susceptible as the square stage if the treatment is administered early in the blossom stage (results obtained from State College) but grades to a fairly resistant period after the young bolls are set (results obtained from the Delta Station). The boll stage was most resistant. At the boll stage, the plants were at the stage of maturation where growth had ceased and no new squares would be expected to mature by the time of picking, even on the uncontaminated plants.

Situations sometimes occur where 2,4-D is applied directly to the cotton plant. Generally this is due to mistaking 2,4-D for one of the cotton insecticides, and as the grower would try to obtain an even coverage of an insecticide over the plant, the 2,4-D may cause extremely serious damage. If the stem tip and foliage are killed at the time the plants are in the seedling, square of early blossom stages, very little yield can be expected from the plants, certainly less than 10 percent of uncontaminated fields.

Factors Which May Enhance or Repress Cotton Response to 2,4-D. Environmental factors are also quite important in the response of cotton to 2,4-D. Extremely succulent plants are more susceptible and show symptoms of 2,4-D contamination more readily than do plants growing under dry conditions. It has been noticed that plants may not show symptoms of 2,4-D injury if the contamination occurs while the plant is making no growth due to a short-time low soil moisture availability and if the drought conditions persist for some time after the treatment.

Observations made independently at both test locations add a further complicating factor in terms of the effect of 2,4-D on yield. Under conditions resulting in a protracted period of low soil moisture availability, the application of 2,4-D to the cotton plant may cause interruption of the normal sequence of flower and boll formation at the time of blossoming by death and subsequent desiccation of the floral parts (Figure 13). The desiccating action proceeds down the flower stalk extending beyond the point where abscission normally occurs; and, as a result, the dead flower remains firmly attached to the plant. That this condition may become serious and produce yield reductions quite apart from those discussed above becomes evident when it is considered that plants have been found where death has occurred at each succeeding floral position and at the time the plant was examined, no bolls had been set. Counts of fruiting positions of plants at widely scattered locations in the field from which this plant was selected showed that eighty percent of the potential fruiting positions had been lost in this manner. The severity of this response varies widely, however, since counts made in other fields have ranged as low as 0.1 percent of the fruiting positions.

The response has only been observed under drought conditions and although the response has been observed to occur in untreated plots, it has always been to a very limited extent; whereas adjacent treated plots have been severely affected.

Varying environmental conditions, as well as insect populations and diseases, undoubtedly affect the severity of this and other responses of the cotton plant to applications of 2,4-D. Further research is required to adequately evaluate their importance.

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Dairy Products Consumption and the Market,

Four Mississippi Towns

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
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STATE COLLEGE MISSISSIPPI

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MISSISSIPPI STATE COLLEGE

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Dairy Products Consumption and the Market,[1] Four Mississippi Towns

By

Dorothy Dickins and Virginia Ferguson[2]

It was the purpose of this study to determine the kinds and amounts of dairy products consumed by representative families in towns of the Prairie and Delta Areas of Mississippi and the factors which affected consumption. Factors related to the market as well as the family were considered as both families and food handlers are important keys in explaining consumption. Information from each is necessary for a better understanding of marketing of dairy products and for making recommendations for more effective marketing programs.

THE FAMILIES

Data were obtained during November and December 1954 by personal interview with a representative sample of families in four Mississippi towns. Two of the towns were in the Prairie or Dairying Area. One, Amory, had a population of about 5,000; the other, Okolona, of about 2,000. The other two towns were in the Delta or Cotton Area. One, Belzoni, had a population of about 4,000; the other, Inverness, of about 1,000. The samples were drawn from a list of family dwellings having electric light meters (or in one town of those having water meters). This sample was supplemented with one taken from a list of dwellings without light meters (or water meters) compiled with the assistance of meter readers for the town.[3]

Only families whose members usually had one meal in the home together were included. Since this was a study of dairy products consumption in the home, one would of course want to include only those families who ate some of their meals at home. Families who usually ate one meal at home together but who happened to be away from home the week preceding the interview were revisited later to get a record for a typical period. Institutional families (those with 5 or more boarders) and families of one person eating at home alone were not included. These families are relatively unimportant from the consumer market viewpoint.[4]

Data were obtained from a total of 405 families—232 white families, 171 Negro families and 2 Chinese families. Fifty-one percent of the white and 3 percent of the Negro families had had incomes of $4000 and over during the year preceding the study (1953-54); and 4 percent of the white and 38 percent of the Negro families had had incomes of under $1000 during this period.[5] The average income of all 405 families was $3078.

In this study income was defined as the sum of receipts from farm operations minus farm expenses; wages and salaries; non-farm business receipts minus business expenses; and all other non-farm income except non-recurrent income such as inheritances.

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[1] This bulletin reports on the Mississippi subproject of the Southern regional project SM-13.

[2] Thanks are due to Dr. Walter Drapala foı making statistical analyses in connection with this report.

[3] An equal number of families from the four towns were interviewed since it was desired to study differences in consumption in smaller and larger towns, and in Delta and Prairie towns. One in every 12th dwelling in Amory. every 5th dwelling in Okolona, every 9th dwelling in Belzoni, and every 2nd dwelling in Inverness was visited.

[4] There were 518 families in the sample; 88 of these were ineligible and 25 could not be contacted or were unable or unwilling to participate.

[5] Sixteen white families and one Negro family did not give income estimates but enough data were obtained about their occupation and socio-economic position to place them in an income group.

The main occupation of the principal earner in two-thirds of the Negro families was unskilled wage work. For white families, semi-skilled and skilled wage work, proprietor of a non-farm business and white collar work were the most important kinds of main occupations. The percentage of white families with these as the main occupation were 32, 22, and 18, respectively.

Most white families in this study had one income earner; most Negro families, two. The homemaker in 65 percent of the white families and in 26 percent of the Negro families had had no gainful work during the year preceding the interview. A husband was the family head in about 90 percent of the white families and in about 70 percent of the Negro families, widows and older daughters being the family head in remaining families.

Since food consumption, including consumption of dairy products, is fairly stable it was thought that current income data might need to be supplemented with some other quantitative measure that would give perhaps a better expression of family level of living. Specified data including ownership of certain material possessions such as a mechanical refrigerator and T. V. set; subscription to newspapers; reading regularly on part of homemaker of food sections in magazines and newspapers; and participation in organizations by family members were used for this purpose. See socio-economic scale used, page 28 in the Appendix.

All families in the study were scored with the socio-economic scale, possible total scores ranging from 0 - 18. In Table 1 in the Appendix is given the percentage of families having specified scores in the scale by socio-economic group classification. (Other descriptive data such as family size, schooling and age of husband and homemaker are given in a footnote of this table).

Six percent of the white families and 65 percent of the Negro families had socio-economic scores of 6 or under; 69 percent of the white and 7 percent of the Negro families had socio-economic scores of 11 - 18. The relationship between total socio-economic score and net income was determined by correlation analysis. The correlation coefficients between net income and socio-economic scores were highly significant. They were for white families, .46; and for Negro families, .60.

THE FOOD STORES

Owners or managers of the 90 food stores in the four towns were interviewed with the use of schedules. Food stores were defined as those in which more than 50 percent of the total sales were from food. Most of the food stores were small independently - operated stores. Only one-fourth had gross yearly sales of $50,000 or over; only 7 percent were chains, either voluntary or corporate. About 40 percent were located downtown, 40 percent in residential neighborhoods and the remaining in a community center (or on a highway on the edge of town).

A description of kinds and prices of dairy products handled as well as promotional work in connection with dairy products was obtained from owners and managers of the food stores, since it was thought that these stores might be an important factor affecting kinds of dairy products consumed by family members.

MILK DRINKING

Since most of the dairy products consumed were in the form of fluid milk and since most of the fluid milk was used in drinking, the findings concerning milk drinking by members of the 405 families will be reported first.

Information was obtained on mealtime and seasonal differences in usual drink of adults and children and on frequency of drinking fresh fluid milk, reasons for not drinking, and amounts and kinds of milk and other drinks by family members.

Usual Drinks of Adults and Children

In figures 1 and 2 are given the usual drinks of adults and of children for the three meals and between meals in winter and summer. "Both milk and non-milk" includes for the most part families in which some adults usually had a milk drink, other adults a non-milk drink; or some children a milk drink, other children a non-milk drink. In only a few cases were two usual drinks given for one person at one meal.

At all meals and seasons there were more adults with a non-milk than a milk drink as their usual drink (Figure 1). The non-milk drink at breakfast was usually coffee in both winter and summer. At both the noon and evening meal the non-milk drink in winter was most often coffee, in summer most often tea. For between meals in both seasons it was soft drinks. The milk drink named as the usual drink for adults was most frequently whole milk. The evening meal was the meal in which more adults had a milk drink.

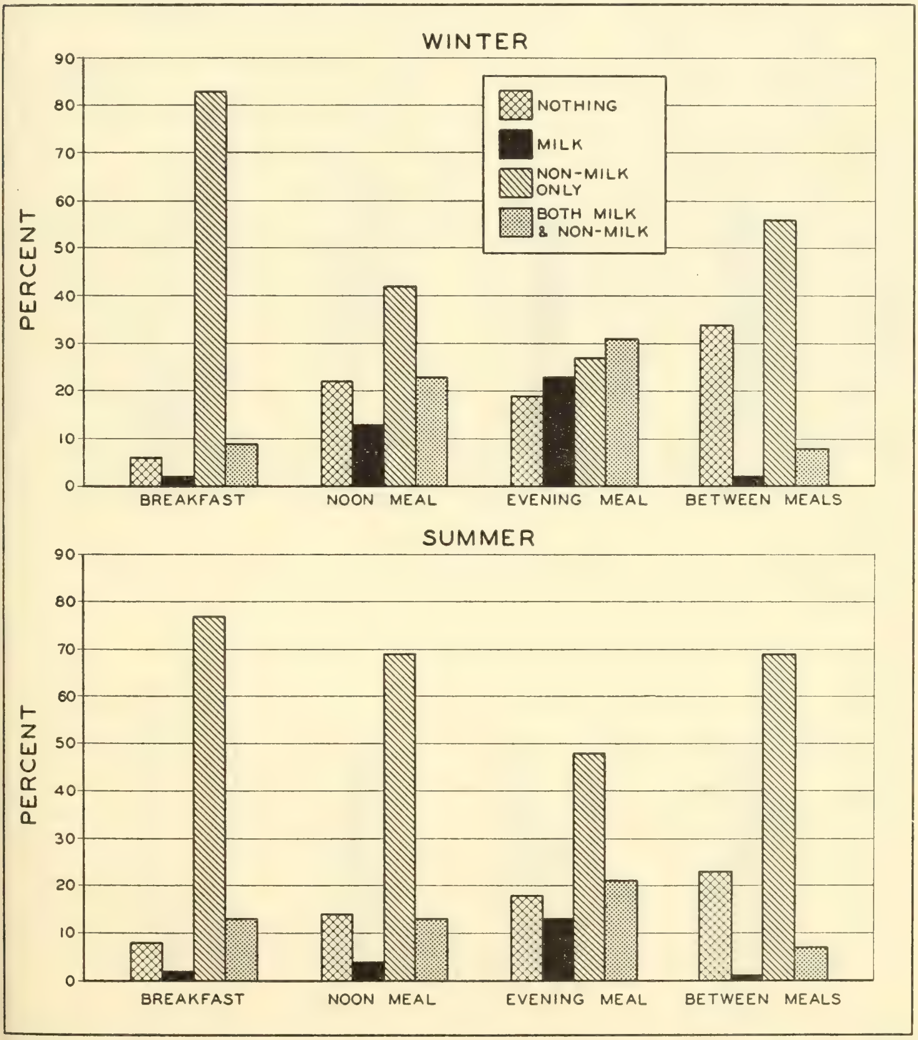

Figure 1. Usual drink of adults in the 405 families in winter and summer at the 3 meals and between meals.

Milk was more popular as the usual drink in winter than in summer.

More children had a milk than a non-milk drink except at noon in summer and between meals. (Figure 2). Iced tea was a popular noon meal drink in summer, soft drinks for between meals. As for adults, the milk drink named was for the most part whole milk. But cocoa was named more for the usual breakfast drink for children than it was for adults.

The non-milk drinks named for children were similar to those for adults, that is: coffee for breakfast, tea for the noon and evening meal and soft drinks for between meals. Coffee was rarely reported as the usual drink for children at the noon and evening meal. Soft drinks were reported for these meals more frequently for children and

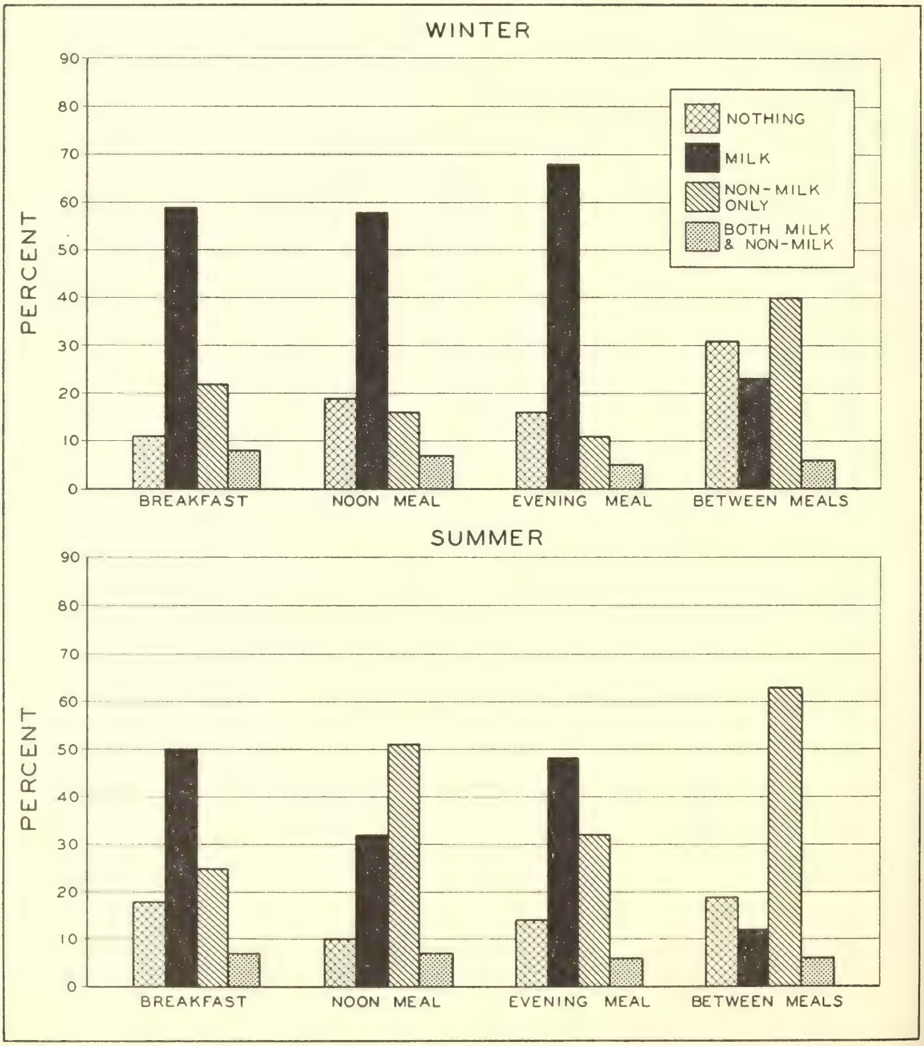

Figure 2. Usual drink of children in the 244 families with children in winter and summer at the 3 meals and between meals.

fruit juice more often mentioned as their usual breakfast drink.

Interviewees in Negro families more than in white families reported "no drink" (or water) for both adults and children at the different meals and seasons. (Tables 2 and 3 in the Appendix). The milk-drinking pattern of white and Negro adults differed little but white children more often had milk at the three meals than did Negro children. The principal difference in drinks of white and Negro adults was the greater proportion of white adults with a non-milk drink as their usual drink.

Frequency of Drinking Milk by Family Members

Information was obtained on the frequency of drinking fresh fluid milk including sweet milk, cocoa/chocolate milk, and buttermilk by each member of the family. There were relatively few in each of the 11 sex-age groups in which family members were classified who never drank milk. Quite a number drank milk sometimes (Table 4 and 5 in Appendix). The percentage who usually drank fresh fluid milk as often as once a day was as follows:

Family members	Percent
Husbands*	44
Homemakers	31
Other adults	37
Males under 6 years	58
Males 6 - 12 years	60
Males 13 - 15 years	61
Males 16 - 19 years	68
Females under 6 years	54
Females 6 - 12 years	46
Females 13 - 15 years	40
Females 16 - 19 years	39

*In the husbands' group in this tabulation as well as other tabulations in the report are included a few widowers.

Frequency of drinking fresh fluid milk is given in the Appendix Tables 4 and 5 for members of white and Negro families. Drinking such milk was reported much more frequently for white than for Negro groups, though there was not a significant difference in homemakers nor in older girls of the two races.[6]

No significant differences were found between frequency of drinking fresh fluid milk by husbands, by homemakers, by boys under 6 and by other sex-age groups in white families residing in smaller and larger towns, or between frequencies by husbands, homemakers, boys under 6, etc., in Negro families residing in smaller and larger towns. Nor were differences found between these groups in Delta and Prairie towns.

Reasons For Not Drinking Milk

When the homemaker reported that the family member usually drank fresh fluid milk "sometimes" or "never" she was asked the reasons for not drinking or for drinking so little. In Table 1 the reasons she gave for the different members are listed. "Costs too much" was much more often the reason given for children not drinking regularly than for adults. Cost was a much more common reason given by the Negro homemaker for her children not drinking fresh fluid milk regularly than by the white homemaker. Another big difference in reasons given for adults and young children was "use other forms of milk." Many infants and young children used canned milk rather than fresh fluid milk.

"Does not like taste" was a reason given for about one-fifth to one-third in every group. This reason was, however, mentioned more for adults and older girls than for other groups.

Amounts of Fresh Fluid Milk and Other Drinks

During the report week homemakers and girls drank less fresh fluid milk at home than did husbands and boys. (Table 2). This was the case in Negro as well as white families (Tables 6 and 7 in Appendix).

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[6] Differences between percentages are considered significant if they are large enough so that they would not occur through chance variation in sampling more frequently than 5 times in 100. For convenience the following publication was used in certain of the analyses: Vernon Davies, Table Showing Significance of Differences Between Percentages. Washington Agricultural Experiment Station Circular No. 102, Sept., 1950.

There was little fresh fluid milk drunk away from home by family members except children 6 - 12 years (see Table 8 in Appendix). This milk was drunk in the school lunchroom. Those children who ate in the school lunchroom drank milk but the majority in this group did not eat in the school lunchroom.

An average of 12.2 pints of fresh fluid milk per family was used during the report week in drinking and infant feeding by the 405 families included in this study. This was 73 percent of the fresh fluid milk used. Practically all of this milk was drunk by family members. Other persons, that is, hired help, guests, drank an average of only .3 pint per family. White families drank an average of about 15 pints, Negro families, about 8 pints.

Homemakers in families in which all members were adults drank on an average more fresh fluid milk than homemakers in families with children. Averages were for homemakers in families of adults only, 3.0 pints; in families of adults and children, 2.0 pints. Consumption of milk of husbands in the two types of families averaged about the same.

The average amount of fresh fluid milk drunk by both husbands and wives was considerably less in families with low cash expense per person per meal than in families with medium cash expenses per person per meal. But those with low cash expense per person per meal were usually low income families. Seventy-two percent of the families with expenses less than 20 cents per person per meal were Negro families. There was very little difference in amount of fresh fluid milk drunk by husbands and homemakers in families with medium and with high cash expenses. Average amounts of milk drunk by husbands and homemakers in families with cash expense per person per meal of varying amounts were:

Table 1. Reasons given by homemaker for "never" drinking fresh fluid milk or for drinking it only "sometimes".

Reasons**	Men	Boys under 13 years	Boys 13-19 years	Women	Girls under 13 years	Girls 13-19 years
	%	%	%	%	%	%
Does not like taste	37	25	19	37	21	34
Costs too much	28	48	58	29	52	50
Prefer other beverages	15	1	15	10	1	5
Uses other forms of milk	2	22	0	*	20	0
Trying to control weight—too fattening	8	0	0	10	2	3
Medical reasons	8	0	4	11	1	3
All other reasons	2	1	4	2	3	0
Total number persons	216	79	26	337	104	38

*Less than .5 percent.

**Does not always add up to 100 percent since a few homemakers did not give a report for certain members.

Table 2. Percentage of family members drinking fresh fluid milk at home and average amount drunk by those drinking, report week November, December, 1954.

Family Members	Total number	Percent who drank fresh fluid milk	Average amount drunk by members (Pts.)
Husbands	336	69	5.6
Homemakers	404	61	3.8
Other adults* (family members)	133	58	4.6
Males under 6 years	98	71	6.4
Males 6 - 12 years	96	90	5.0
Males 13 - 15 years	36	86	5.8
Males 16 - 19 years**	34	85	6.8
Females under 6 years	104	73	5.8
Females 6 - 12 years	103	85	4.4
Females 13 - 15 years	35	86	3.4
Females 16 - 19 years*	22	77	3.2

*Six were not at home during report week

**Four were not at home during report week.

	Average cash expense for food per person per meal		
	Under 20c	20 - 39c	40c & over
Husbands	2.9 pts.	4.6 pts.	4.4 pts.
Homemakers	1.9 pts.	2.7 pts.	2.8 pts.

Homemakers were classified into three schooling groups, according to grades completed; 6 grades or less, 7-11 grades, high school or more. Consumption of fresh fluid milk during the report week by women in these three groups averaged 2.2, 2.4, and 2.6 pints respectively.

Information was obtained on the kinds and amounts of fresh fluid milk and non-milk drinks used during the report week. These are given in Table 3.

As is shown, the most popular kinds of milk used were pasteurized homogenized milk and buttermilk; while coffee, soft drinks, and vegetable and fruit juices were the most popular nonmilk drinks used. Since most tea used is as iced tea and since the study was made in November and December, use of tea was undoubtedly less than in certain other seasons of the year.

When asked to name the usual drinks for meals in summer and winter for family members, most homemakers did not mention fruit juices. In other words, these juices were not regarded as a beverage by the majority; but a few so regarded them and for this reason they are shown.

Amounts of Canned and Dried Milk

Of the 1401 family members at home during the report week, there were only 45 who were reported as drinking dried milk and only 64 canned milk. Thirty-seven of those drinking dried milk were adults. The 45 drinking dried milk included one infant fed a dried milk formula. Forty-nine of those drinking canned milk were children and most of the children were under 6 years. The 45 drinking dried milk drank on the average about one-third of a pound each (5.5 ounces) while those drinking canned milk averaged a little more than 4 large cans (about 58.8 ounces).

Infant Feeding

Eleven of the 31 infants in the 405 families included were breast fed. But three of these were only part-breast fed; that is, they had other kinds of milk too. One had fluid milk and breast milk, the other two canned milk and breast milk. During the record week one baby was fed a milk formula, 5 received fluid milk only, 13 canned milk only, and one both canned and fluid milk.

Those infants who received fluid milk only averaged 7.7 quarts. Amounts consumed by them ranged from 5 quarts to 10.5 quarts. Those infants using canned milk only averaged 98.3 oz. (nearly 7 large cans). Their consumption of canned milk ranged from 42 to 207 ounces.

DAIRY PRODUCTS USED

Three-fourths or more of the families had used during the year preceding the interview the following dairy products: sweet homogenized milk, buttermilk, evaporated whole milk, yellow cheese and ice cream (Table 9 in Appendix).

Three-fourths or more reported they had never used the following dairy products: sweet skim milk, coffee cream, half and half milk, evaporated skim milk and dry cream.

When asked whether their families used the specified dairy product more in winter, in summer, or about the same, two-thirds or more of the replies for all dairy products except frozen ones were "about the same." For frozen products four-fifths or more replies were "more in summer." There was not a significant difference in summer and winter use of the other dairy products reported except for chocolate milk, whipping cream, condensed milk, cottage cheese, all reported as used more in the summer. (See Table 10 in Appendix).

As has already been shown, milk drinks were reported somewhat more frequently as the usual drink by adults and children in winter than summer and most milk was used for drinking. It would therefore seem that more fluid milk would have been reported as used in winter than summer and this was not the case. It may be that the pattern for total milk is fairly stable and that when less is used for drinking more is used in preparation.

About one-half the families used canned milk, about one-seventh dried milk during the report week. (Figure 3). About one-half the homemakers reported they had never used dried milk. This is of course one of the newer types of dairy products as is dry cream. At the time of the study instant dried milk was just beginning to come on the market. Dry cream was carried by less than one-fifth of the local groceries.

As stated before about three-fourths of the fluid milk used was used for drinking. In contrast about one-third of the dried milk was used for drinking. These proportions may have changed since instant milk has been brought in large amounts on the market. Approximately one-half the canned milk was used in drinking or infant feeding, usually in infant feeding.

Yellow cheese (including both unprocessed and processed) was the only kind of cheese used to any extent by the families. About 70 percent of the white families and about 50 percent of the Negro families used some during the report week. Average amounts used by families using for both groups was about the same; that is, slightly less than one pound.

Interviewees were asked: "Let's say you did not have any meat for your dinner but you did have on hand materials to cook an egg dish, a dish of dried peas or beans, or a cheese dish. Which one would you cook if you wanted to please your family most?" The replies of homemakers in white and Negro families were as follows:

Replies*	**In white families**	**In Negro families**
	%	%
Cheese	39	25
Eggs	23	17
Dried peas or beans	30	49

*Does not add up to 100 percent since a few homemakers did not reply or would not make a choice.

It may be that the Negro woman's choice of dried peas and beans as a meat substitute more often than the white woman's is related to the fact that she uses them more. One likes what one is accustomed to eating.

Fresh cream was a dairy product used to a very limited extent by families during the report week (only 11 percent used whipping cream and 4 percent other fresh cream). Limited use seemed to be related to costs and other factors such as "too rich," rather than use of competing products such as whipped topping. Only one percent of the families reported its use during the study period.

Twenty-eight percent of the families reported use of butter, 83 percent of

Table 3. Percentage of the 405 families using and average amounts by those using various kinds fresh fluid milk and non-milk drinks during report week, November-December, 1954.

Product	Percent using	Average amount by those using
Pasteurized homogenized whole milk	75	7.4 qts.
Pasteurized plain whole milk	6	6.5 qts.
Raw whole milk	7	7.6 qts.
Sweet skim milk	*	5.0 qts.
Buttermilk	63	3.1 qts.
Chocolate milk or drink	4	1.7 qts.
Condensed coffee	16	2.6 oz.
Ground coffee	69	.8 lbs.
Tea	33	3.4 oz.
Coffee substitute	2	1.7 oz.
Soft drinks	64	11.1 bot.
Powdered drinks	6	2.5 pkg.
Fruit and vegetable juices	52	49.1 oz.

*Less than .5%.

**For further information see Table 9 in Appendix.

oleomargarine during the report week. Average amounts of these two products used by families using were for butter .8 pound and for oleomargarine 1.2 pounds.

Only about one-third of the families used ice cream during the report week, November-December. Use of sherbet and ice milk at this time was negligible. Those families who ate ice cream averaged about 3 pints each. (See Table 9 Appendix).

Failure to use could not be related to the stock of dairy products on hand in food stores. Practically all dairy products listed on the store schedule were carried by one or more stores in each town. But it is to be noted that even though the product was available in some food stores in town, it may

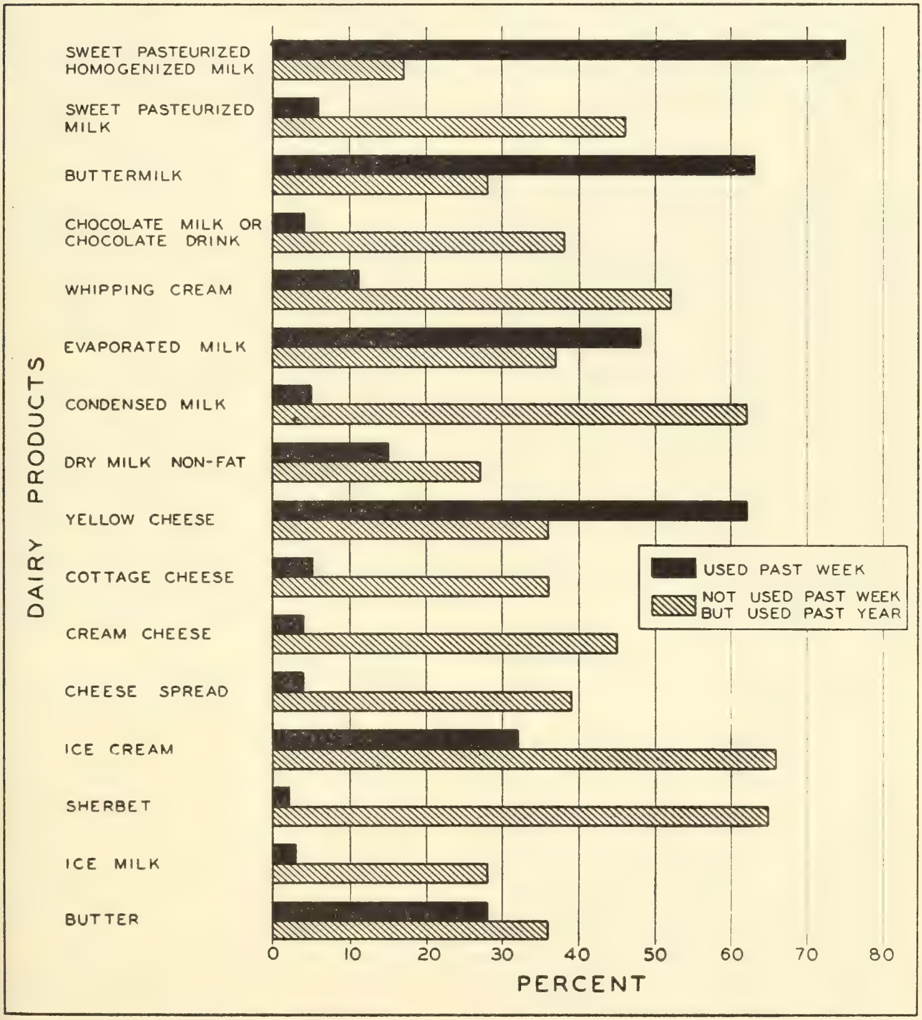

Figure 3. Percentage of families using specified dairy products during week preceding interview and percentage not using this week but using sometimes during the past year, 1953-54.

not have been carried in stock in the particular store or stores in which the family traded.

The dairy products carried by more than 50 percent of the stores surveyed were:

Products	**Percent of food stores carrying**
Evaporated milk	100
Homogenized, past. milk	93
Buttermilk	92
Ice cream	91
Yellow cheese, unprocessed	89
Sherbet	80
Condensed milk	78
Dried non-fat milk	78
Yellow cheese, processed	69
Butter	56

In Table 11 of the Appendix the average amount of milk and its products of specified kinds used during report week by families of this study are compared with amounts used by families during one week in other studies.

Cost of Dairy Products Used

Five of the 405 families in this study used no bought dairy products of any type at home during the report week. Three of these had incomes under $1000, two had incomes from $1000 to $2500. The average costs of the dairy products used during the report week by the 400 families using bought products classified by income were:

Income	**Cost dairy products used**
Under $1000	$1.59
$1000 - $2500	2.22
$2500 - $4000	3.34
$4000 and over	3.86

Families with higher incomes spent on the average more for food as well as more for dairy products. Those with incomes under $1000 spent an average of 15 cents per capita per meal for food at home; those with incomes of $1000 to $2500 spent an average of 21 cents per capita per meal; those with incomes of $2500 to $4000 spent an average of 28 cents; and those with incomes of $4000 and over, an average of 34 cents.

Families in this study spent during the report week an average of $17.22 for food at home. Sixteen percent of this was for dairy products.

Homemakers were asked about how much members of the family had spent for between-meal snacks eaten away from home during report week such as soft drinks, ice cream, candy. If an amount was reported they were asked how much of it was for ice cream, milk drinks, or other dairy products. About one-third of the families reported some expenses for dairy products of this type. Those families having spent money this way had spent during the report week an average of 68 cents.

Type of family affected expenditures for dairy products. Average expenditures for those purchasing were:

Type of family	**Average expenditures by those purchasing**
Adults only (all members 20 yrs. and over)	$2.14
Adults and young children only (all children 12 yrs. or under)	3.22
Adults and older children (one or more children 13-19 yrs. May or may not have children under 12 years)	3.51

But families of adults only were small families, those with older children larger families. (Ninety-six percent of the adult-only families had fewer than 4 members, 59 percent of the families of adults and young children had this few members, and 43 percent of the families with older children this few).

Those buying pasteurized milk, either plain or homogenized, paid an average of 23.6 cents per quart. But those buying whole raw milk paid an average of 15.9 cents per quart. Most of the whole raw milk was purchased direct from producers, sometimes relatives who let the family have the milk at a low price. The average price paid for buttermilk was 14.8 cents per quart. Here, too, purchases include some bought from producers.

Some of the butter used was country butter which was purchased by a few families for as low price as 50 cents a pound. However, most of those buying butter paid 75 or 80 cents a pound.

Country butter was sold by a few stores at as low as 60 cents a pound.

Prices charged for dairy products varied from store to store. Some of the variation of course was related to quality and brand; other variation to pricing policies and overhead or other expenses of the particular store. Listed below are some of the price variations found in specified dairy products in the 90 grocery stores in these 4 towns:

Dairy product	Price and unit
Pasteurized milk*	22c - 26c (qt. carton)
Ice cream	59c - $1.20 (½ gal.)
Butter	60c - $1.00 (1 lb.)
Cheddar cheese (unprocessed)	43c - 69c (1 lb.)
Processed cheese	31c - 46c (½ lb.)
Evaporated milk	6.2c - 11.5c (6 oz.)
Evaporated milk	12.3c - 20c (14½ oz.)
Dry skimmed milk	15c - 20c (6½ - 7 oz.)
Dry skimmed milk	29c - 41c (10½ oz.)
Whipping cream	25c - 35c (½ pt.)

*Includes both plain and homogenized milk; does not include Golden Guernsey milk.

Variation in prices of ice cream, butter, cheese, canned and dried milk in the individual towns followed very much the pattern of that of the four towns. Variation within a town was much less however for pasteurized milk and whipping cream. Price per quart for pasteurized milk varied as much as 3 cents from store to store in all towns. Cream usually 2 cents, but in one town variation was 7 cents.

PLACE OF PURCHASE AND OTHER SHOPPING HABITS

Homemakers were asked who usually buys the groceries in the family and about 4 out of 5 replied that they did this alone or together with either their husbands or other members of the family. The percentage giving various replies were:

	Percent
Husbands (only)	14
Homemakers (only)	54
Homemakers and husband	21
Homemaker and other member of family	4
All others	7

Expenditures per person per meal were examined to determine if there was any difference when husband did the shopping alone, when homemaker did it alone, and when they shopped together. No significant differences were found.

Eighty-nine percent of the homemakers in this study reported that most of the food for their families was bought by personal shopping. Only 4 percent reported that most of the food-buying was done by telephone. Seven percent said that these two methods were used about the same in their families.

Source of Purchases

In Table 4 is shown that grocery stores were the source of purchase for most perishable dairy products bought. More sweet milk and thin cream were bought from distributors than other products listed, and more buttermilk and butter from local producers.

Information was obtained on the effect of a standing order at the creamery or milk plant on milk consumption. Sixteen percent of the families had a standing order at a milk plant or creamery. These families used an average of 9.3 quarts of purchased milk during the report week from these creameries or milk plants. In addition they purchased from other sources an average of 1.3 quarts, making a total of 10.6 quarts in all.

An average of 6.8 quarts of bought milk was used by other families. Operators of creameries and milk plants say that delivery is good business. It was found however that relatively more white families and relatively more families with high incomes had a standing order. In other words "standing order" families included the type that buys higher amounts anyway.[7]

The fluid milk distribution pattern in the Prairie and Delta Area towns was quite different. Merchants in Amory (the larger Prairie town) traded almost exclusively with the two local distributors. In Okolona (the smaller Prairie town) trade was divided between the local distributor and two distributors from neighboring towns. There were no milk plants located in either of the Delta towns surveyed but fluid milk and cream were obtained principally from plants located in the Delta Area. These plants, however, obtained part of their milk from outside the Delta.

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[7] Delivery service may however help one milk plant better compete with another. No investigation was made on this point.

Marketing Services

Homemakers were asked to give the names and addresses of grocery stores where they had bought any food during the past week, distance from their homes, whether or not they had used credit, delivery; also to indicate which stores were the major source of their food supply and which were near their work. Information from these questions are summarized in Table 12 in the Appendix. In most of the grocery stores in which the family had traded neither credit nor delivery service had been used, but credit was used in stores where the major food supply was bought more than in all stores traded with, especially by Negro families. Very few families used delivery.

Managers in 71 percent of the 90 grocery stores reported that credit was extended; 40 percent said they would deliver food to the home. There were, however, more than two cash and carry stores in every town.

Grocery stores in these four towns surveyed were open to the public an average of 80 hours per week. About one-half of them were open at some time on Sunday. In only one town was there no store open on Sunday. It would thus seem that families in the four towns could select from a number of services, as well as find some store open at almost any time they wanted to buy dairy products.

Sizes of Purchases

Information was not only obtained on amounts of the different dairy products used during the week preceding the interview and the place of purchase but also on the amounts bought at the last purchase. Last purchases of whole pasteurized milk (either plain or homogenized) averaged about 1½ quarts which would mean about 4 or 5 purchases a week. Raw whole milk (usually bought direct from producers) was purchased in larger amounts—an average of about 3¼ quarts at one time. This would mean about 2 purchases a week. Buttermilk was bought about as often as whole raw milk but last purchases averaged 1.7 quarts, or about one-half the amount of last purchases for whole raw milk.

Last purchases of canned and dried milk and dried cream were larger than the amounts of these products used during the report week, as were last purchases of ice cream and ice milk. These frozen desserts were often bought in quantities of one-half gallon on week-end specials and kept in the freezing compartment of the refrigerator or in a home freezer. Last purchases of other dairy products were in amounts of about the same as such products used during the week, except for "half and half." Last purchases of this light cream averaged one pint and average amounts used by families using were 1.5 pints.

Table 4. Percentage of families using purchased dairy products of specified kinds during the report week by source of purchase.*

Dairy product	Milk or ice cream plant	Grocery store	Local producer
Sweet milk	16	85	5
Buttermilk	4	76	20
Whipping cream	8	92	0
Other cream**	15	87	0
Butter	0	78	22
Ice cream	8	92	0

*Sometimes adds up to more than 100 percent since some used products from more than one source.

**Coffee cream or half and half.

Containers For Fluid Milk

Homemakers who had used fluid milk the past year (all except one of the 405 families) were asked if they purchased it in cartons, bottles, or both. Fifty-one percent had purchased it in both cartons and bottles, 42 in cartons only, 3 percent in bottles only.[8] Those homemakers who had purchased milk in both bottles and cartons were asked which they preferred and why.

Of the 205 homemakers who had used both bottles and cartons during the past year, 55 percent (113) expressed a preference for cartons, 38 percent for bottles, and 7 percent said they had no preference.

Those stating a preference for cartons gave as their reasons:

Reasons*	Percent
Not as much trouble, don't have to wash and return	89
Keeps better in carton, safer, and more sanitary	15
Milk tastes better in cartons	12
Milk in cartons takes up less room in the refrigerator	4
Milk in cartons is easier to carry	2

*Some gave more than one reason.

The reasons given by the 78 for preferring bottles were:

Reasons	Percent
Don't like taste of milk in cartons. Like taste of milk in bottles—wax gets in milk	42
Carton gets soft, leaks in refrigerator, messes up refrigerator	14
Can't tell how much milk is in carton; in bottle can see through	13
Just like better	13
Carton doesn't pour as well. Carton spills, like to pour from bottle	10
May be more sanitary in bottles	6
Don't like milk to sit in carton	4
Milk stays colder in bottle	1
Local product in bottles	1
Cheaper in bottles	1

Homemakers were asked if they had purchased milk in more than one size container. Eighty of the 405 replied that they had and 79 of these reports involved purchase of quarts and half-gallons.[9] Sixty-two of the 79 having used both quarts and half-gallons expressed a preference for the quart, 17 for the half-gallon.

Reasons given for preferences were:

Reasons	Prefer qts. to half-gals.	Prefer half-gals. to qts.
	%	%
Easier to handle	25	35
Stays fresh, easier to keep fresh	25	0
No waste or spoilage	21	0
Suitable for refrigerator	16	24
Right size for family and use	3	5
Easier to wash	1	0
Milk tastes better	1	0
Cheaper	0	12
Don't have to buy so often	0	12
Get more milk in half-gallon*	0	12
No reason	8	0

*Commonly believed by a very few that there is more milk in one-half gallon than in 2 quarts. This reason was given in pretesting the schedules as well as in the study.

The 377 homemakers who had bought milk in cartons were asked if they would like a different color of carton for each different kind of milk. Only about one-third said they would. But only 7 of these cared what the color was for homogenized, for pasteurized, or for buttermilk.

Ninety-nine percent of the stores handled milk in quart cartons; 24 percent in quart bottles; and 18 percent in half-gallon cartons. Several stores in the Delta Area handled the "twin pack" or two one quart cartons fastened together with a easy-to-carry handle.

Merchants who handled both bottles and cartons were asked to estimate the percentage of total sales made in bottles. When both were available the carton container was more popular according to estimates given. An average of 20 percent of the whole milk sales was stated to be in glass. When both quart and half-gallons were handled, merchants reported that about four-fifths of the total whole milk sales were in quart bottles.

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[8] A few had home produced milk; a few did not report.

[9] One woman reported having purchased in gallons and quarts and preferred the gallon as it was the right size for her family.

ATTITUDES AND KNOWLEDGE OF HOMEMAKER CONCERNING PROPERTIES IN MILK

Two questions were asked homemakers which gave information on attitudes concerning and knowledge about properties in milk. The first of these was "Which foods do you think your family ought to have every day?" If milk was not named they were asked, "Which beverages (or things to drink) do you think your family ought to have every day?" This question was among the first on the schedule, and was asked before any of those concerning milk products. The other question was "What would you say milk has in it?"

Listed below is the percentage of homemakers reporting milk as a food, as a beverage, and not naming milk at all; and the place in which milk was given when named as a food or a beverage:

	Percent**
Milk named as a food (Total)	**80**
Milk named 1st	22
Milk named 2nd	16
Milk named 3rd	22
Milk named 4th	13
Milk named in other positions	7
Milk named as a beverage (Total)	**14**
Milk named 1st	13
Milk named 2nd	1
Milk named in other positions	*
Milk not named as food or beverage	**5**

*Less than .5%.
**Does not add up to 100% since a few did not reply.

Four-fifths of the homemakers named milk as a food their families should have every day, but only one-fifth gave it first place among foods. About one in seven thought of it as a beverage.[10]

The second question produced many kinds of replies—from the very specific to the more general, such as "calcium," "minerals," "builder of bones and teeth." The replies are summarized in Table 13 in the Appendix.

Milk is the main source of calcium in the American diet and also contributes high-quality proteins, and riboflavin, niacin, and thiamine, part of the vitamin B complex. Vitamin D, an important nutrient, is supplied by vitamin D milk. Milk has also a generous amount of vitamin A.

The most frequent reply to the question "What does milk have in it" was, "vitamins," "all the vitamins." Forty-nine percent of the interviewees gave this reply. It was a reply more often given by Negro than white interviewees. (See Table 13 in Appendix).

"Fats, butter, cream" was the reply of next importance (35 percent of the women gave it). This reply was given by more white than Negro women. Thirty percent of the homemakers interviewed mentioned protein, and 26 percent calcium or lime. Most of the women giving protein and calcium or lime were white women. No woman interviewed said that milk contained riboflavin, niacin, or thiamine, but 6 mentioned vitamin B. Eight women mentioned vitamin D and 4 vitamin A.

There was a close relationship in schooling of the interviewee and her reply as to what milk had in it, as is shown:

Grade completed	Calcium or lime	Protein	Fats, cream, sugar—carbohydrates
	%	%	%
Less than 4 grades	6	6	19
4 - 6 grades	6	6	15
7 - 11 grades	14	23	26
Finished high school	59	40	51
College training	54	50	64

It is interesting to note here that 26 percent of the interviewees from families with incomes under $2500 mentioned fats and/or cream, sugar, calories. The percentage for those with incomes $2500 and over mentioning them was 51.

PROMOTION AND EDUCATION

Families in these towns of Mississippi were exposed to dairy products promotion and education programs outside as well as within local groceries. Such promotion and education was provided in the foods section of daily and weekly newspapers and of magazines, over the radio and TV, and in connection with organizations in which many participated.

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[10] It was thought that as the study advanced in a town there might be progressively more families naming milk first. No relationship was found, however, in week of interview and replies of white and of Negro homemakers to this question.

Homemakers in three-fourths of the white families and in one-fourth of the Negro families read regularly one or more newspapers or magazines with a foods section. Of those publications mentioned with a foods section by these town women, 49 percent were women's magazines such as **McCalls, Ladies Home Journal, Good Housekeeping;** 30 percent were daily papers with a foods section, usually once a week (on Friday). Twelve percent were farm magazines and 7 percent magazines sold at grocery stores for 5 cents such as **Family Circle, Today's Woman,** and **Better Living.**

More homemakers should have been reached by the radio (granted there were milk-promotion programs over the radio and that they were listened to) than by the foods section in papers and magazines, since more had a radio than read regularly papers and magazines with a foods section. Practically all families included in the survey (nearly 100 percent of the white and about 90 percent of the Negro families) owned a radio. Also, a little more than one-third of the white families had a TV set.

Organization participation was also a potential educational and promotional source for dairy products; but such participation was for the most part in connection with the church. One or more members in 54 percent of the families participated in organizations other than the church. In many of these organizations one would get little information about milk products. It is believed, however, that one might get some in connection with socials and contacts resulting.

There was a total of only 55 participants in the 405 families attending clubs or organizations in which information concerning the use or value of dairy products is regularly given; such as home demonstration clubs, the Farm Bureau, home improvement clubs, 4-H clubs, FFA clubs, and FHA clubs.

Store Promotion

Merchants were questioned about their experiences during the preceding year in promoting the sale of dairy products. In about two-thirds of the 90 stores some type of promotion had been used. Those who used no promotion were practically all operators of small groceries.

Of those who had done promotional work a large percentage (83%) reported having used advertising material provided by dairies, ice cream suppliers, manufacturers of canned and dried milk and cheese. Brightly-colored store posters, banners, and stickers were placed in stores by plant representatives. Some companies provided premiums to be awarded customers who bought their product in certain amounts, or "prizes," to those with designated quantities of the products' wrapper. Folders of recipes featuring certain items were placed on store shelves.

Fifty-three percent of the merchants, however, originated promotional work themselves. Of the total advertising or promotion originated by store operators, percentage of different types was as follows:

Price reduction sales	24%
Store displays	24%
Newspaper advertising	19%
Lettering on store front	7%
Trade stamps (advertising store as a whole)	7%
Handbills	5%
Radio	4%
Other types (2% of the stores)	10%

In the "other types" are included free samples (cheese), calendar advertising. Advertising on television was mentioned by the one manager of a corporate chain store.

Another factor of importance is the attitude of the merchant towards dairy products. Many of these merchants give individual attention to the customer and customers depend upon them for advice.

There were two types of questions in the store schedule from which one might obtain some light on probable attitude of the merchant towards handling dairy products. The first one related to the profit he made on the sale of fluid milk. No merchant thought he made a good profit. But 33 percent thought the profit fair, 58 percent very little. Two percent said there was no profit and the remaining did not express themselves one way or the other. The second type of question pertained to problems in connection with handling dairy products. Two-thirds of the merchants named no problem in connection with handling fluid milk. Only a few mentioned problems in connection with handling ice cream and cheese.

When merchants were asked to discuss ways in which they thought milk sales could be increased, more replies were centered on non-price factors than price factors. Some examples of these are: "Improve facilities for keeping milk fresher;" "Display it better;" "Improve quality;" "Advertise it more;" "Keep it sanitary;" "Give more education to the public concerning its nutritive value."

Promotion of Particular Dairy Products in Stores

Cheese was the dairy product most extensively advertised by individual merchants in the study, but very little promotional work was reported as having been done by the cheese manufacturer as shown:

Product	Promotion by merchant	Promotion by processor
	%	%
Fluid milk and cream	14	11
Canned milk	22	19
Dried milk	7	21
Cheese	32	5
Ice cream	25	44

The typical means of displaying milk was in a meat counter. Here it was usually visible to the consumer, but sometimes close scrutiny was necessary to find it. In one-fourth of the stores milk was not visible. In only about one in six stores was milk kept in a dairy or milk cabinet with open top.

Cheeses were rarely centered in one location in the store. Those requiring refrigeration were usually kept in a meat counter, dairy cabinet, or home-type refrigerator. Cheese in jars was kept on store shelves and on top of meat counters.

The most common type of advertising for dairy products by merchants was "special" sales; advertisements in newspapers, over the radio, on hand bills, by store front lettering. Also, in case of canned milk and cheese, store displays were sometimes used.

Determining Effect of Promotion and Education

Five questions were included in the family schedule with the idea of finding out the types of promotion and education that had caused the family to use more dairy products, either more of the same product, the product in a different way, or a new dairy product.

In one of these questions the homemaker was asked about new foods or new recipes which she had tried during the past year, to describe and to tell who or what gave her the recipe or idea to try. Fifty-two percent reported one or more new dishes tried. Thirty-two percent of the women reported one or more new dishes involving dairy products. Fifty-three percent of the new dishes with dairy products involved sweet milk, 32 percent cheese, 10 percent evaporated milk, and the remaining 16 percent buttermilk, dried milk, and condensed milk. Types of dairy products used adds up to more than 100 percent since in 11 percent of the new dishes 2 dairy products were used. Casserole dishes, chiffon pies and congealed salads were among the most common new dishes involving dairy products.

The most important sources of suggestion for the 192 new dishes involving dairy products were:

Source	Percent
Friends	40
Recipes (magazines, newspapers, cook books)	26
Relative	8
Advertising material	8
Seeing in store or having clerk call attention to	5

Another question used to find out types of promotion or education that had caused the family to use dairy products was: "Do you remember any particular advertisement (such as in newspapers, magazines, in stores, over radio or TV) about milk products?" Yes__ No__ "If yes, what?"______ "Source?" "If yes, did this cause you to use more?" Yes__ No__.

Ninety-eight women (or about one-fourth) reported they remembered one or more particular advertisements about milk products. But three of these women could not remember where they saw the advertisement. The 95 who could remember reported on 116 advertisements. These advertisements and where they were seen were as follows:

Product	Where seen
Evaporated milk (39)	TV, 14; radio, 12; magazines, 11; newspaper, 1; store, 1.
Ice cream (30)	TV, 19; magazine, 7; radio, 3; newspaper, 1.
Whole milk (18)	Radio, 7; newspaper, 5; TV, 3; magazine, 3.
Dry milk (18)	TV, 7; radio, 5; magazine, 4; newspaper, 1; store, 1.
Cheese (11)	TV, 6; magazine, 4; newspaper, 1.
Dry cream (1)	Radio (1).
Condensed milk (1)	Newspaper (1).

Forty-one percent of the advertisements remembered were on TV, 25 percent in magazines, 24 percent on the radio, 10 percent in newspapers and 2 percent in stores.

Seventeen percent of the women remembering advertisements of dairy products said the advertisement had caused them to use more of the product. These involved 19 different advertisements including 7 on TV, 7 in magazines, 4 on the radio, and one in the newspaper. Eight of these advertisements were of evaporated milk, 5 of ice cream, 2 of whole milk, 2 of dry milk, and one each of cottage cheese and condensed milk.

When asked, "Have you or any member of your family been to any group meeting during the past year where use and preparation of dairy products was demonstrated or discussed," only eight women answered in the affirmative. Two women reported that they tried the demonstration later. Six of the demonstrations were attended by the women themselves, one by her children and one by her husband. The two who tried the product demonstrated later had attended the demonstration themselves.

Homemakers in 33 of the families, when asked if during the past year they had received information concerning dairy products from doctors, nurses, health clinics, replied that they had. In all except two cases the doctor, nurse, or health clinic had advised specified kinds and amounts of milk for a certain member or members. In these two cases a doctor had suggested that the member was allergic to milk.

The last question for finding out the type of promotion or education that had caused the family to use more dairy products was asked only of the 176 families with school children. This question was: "Have your children ever asked you to serve or use in preparation a dairy product they had seen, heard about, or tasted away from home?" Only 17 women replied in the affirmative. These 17 women mentioned 19 dairy products. Nine involved use of dairy products in desserts such as "lemon pie with milk," "homemade ice cream like Johnny's mother makes," "pineapple pudding." Three had asked for bottled chocolate milk. One had asked for whole milk in bottles such as served at the school lunchroom; another for milk from a certain creamery. Other requests were for malted milk, ice milk, and certain ice cream "novelties."

It might seem from the analysis of the replies to the five questions relating to the effect of promotion and education on consumption of dairy products that best results would be obtained by more effective use of local leaders; from recipes in magazines, newspapers, cookbooks; and by advertising on TV and radio.

PER CAPITA CONSUMPTION OF MILK PRODUCTS AND RECOMMENDED AMOUNTS

Milk products used by the family were converted into quarts of fluid milk equivalent which included not only fluid milk but the fluid milk equivalent of evaporated, condensed and dry milk, cream, ice cream and cheese on the basis of protein and calcium content. Conversion factors developed by the Human Nutrition Research Branch of the U. S. Department of Agriculture to express the nutritive value of each product as compared with fluid whole milk were used.

Quantities for different family members in the revised low-cost food plan developed by specialists in the Human Nutrition Research Branch of the U. S. Department of Agriculture for milk products were used in estimating milk needs for the family.[11] The recommended dietary allowances of the National Research Council were used as the nutritional basis of the food plans at different costs.[12]

Quantities of fluid milk equivalent per week suggested for various family members in the low-cost plan were:

Young children and boys:	
Young children	**Qts.**
1 - 3 years	5
4 - 6 years	5
7 - 9 years	5
Boys	
10 - 12 years	6
13 - 15 years	6½
16 - 20 years	6½
Adults and girls:	
Adults	**Qts.**
Women	3½
Nursing mother	10
Men	3½
Girls	
10 - 12 years	6
13 - 15 years	6
16 - 20 years	6

No recommendations for children under a year were made by these specialists in the U. S. Department of Agriculture since most infants are fed according to directions of a physician or a nurse. Amounts fed vary with weight, growth, and the like. Therefore, in determining whether or not the family had milk in the quantities recommended, infants are treated separately.

Per Capita Consumption

The 405 families included in this study averaged 12.25 quarts of fluid milk equivalent during the week (or 4.05 quarts per capita).[13] Of this amount an average of 8.40 quarts was in the form of fresh fluid milk, (that is sweet milk, chocolate milk, buttermilk) 3.85 quarts in the form of converted milk (that is, dried and canned milk, cheese, ice cream, cream).

The per capita consumption of milk was calculated by dividing the quarts of equivalent milk used at home by the number of members fed from the home supply during the study week. The number of members fed from the home supply was obtained by dividing the total number of meals eaten at home during the report week by 21 (number of meals in one week).

Per capita consumption of dairy products (equivalent quarts fluid milk) decreased rapidly with increasing household size and especially for Negro families, as is shown:

	Percent families with 4.0 quarts milk equivalent or more per capita*	
Household size	**White**	**Negro**
Under 2 members	67	65
2.0 - 3.9	60	35
4.0 - 5.9	48	9
6.0 and over	18	3

*The difference in percentage of both white and Negro families of 2 and 6 and more members is highly significant.

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[11] Rural Family Living, March, 1955, Home Economics Research Branch, Agricultural Research Service, U. S. Department of Agriculture, p. 10.

[12] Recommended Dietary Allowances (1953 Revision), National Academy of Sciences, National Research Council, Publication 302, p. 22.

[13] This average per capita differs little from amount (4.29 quarts) found for 1021 urban and rural families of Attala, Marion, Jones and Adams Counties, Mississippi. See "Home Consumption of Milk," Dorothy Dickins, Miss. Agri. Exper. Circular 198. Sept. 1955.

It was thought when planning the study that families living in the Prairie or Dairying Area would consume larger amounts of dairy products. In Table 14 in the Appendix is given average per capita consumption of milk equivalent during study week for Prairie and Delta town families by race. There was not a statistically significant difference in per capita consumption of white families in the towns in these two areas nor in Negro families in towns in the two areas.[14]

Per capita consumption of quarts fluid milk equivalent of white and Negro families by income is shown in Table 15 in Appendix.

Recommended Amounts

About two-thirds of the white families and one-third of the Negro families had milk products in recommended amounts or more for families of their size and composition.[15] According to chi square tests there was a high association in income level (under $2000; $2000 - $2999; $3000 and over) and receiving milk products in recommended amounts when white and Negro families were grouped together. (Appendix Table 16). When analyses were made separately for white families and for Negro families no associations were found. Some association in income level and receiving recommended amounts might have been shown for Negroes had there been more Negro families with incomes of $3000 or more.

Chi square tests were made on differences in white and Negro families receiving recommended amounts at each of the three income levels. At only the $2000 - $2999 income level were significant differences found. Relatively more white families in this income group than Negro families in the same income group had recommended amounts of milk products.

There was found also a high association in socio-economic score (6 and under, 7 - 10, and 11 - 18) and receiving milk products in recommended amounts when white and Negro families were grouped together. (Appendix Table 17). When analyses were made separately for white and for Negro no association was found in socio-economic score and receiving milk products in recommended amounts in white families. There was found, however, a high association in these two variables in Negro families. There were relatively more Negro families with low socio-economic scores with less than recommended amounts of milk products.

It is interesting to note here that for Negro families rating on the socio-economic scale seemed more related to getting recommended amounts of milk products than did income.

Very low milk products consumption; that is, under 50 percent of the recommended amounts, were especially centered in families with children. Of those families who had less than half the recommended quantities of milk products, three-fourths were families with children. Twelve percent of the families consisting of adults only and 34 percent of the families with one or more children 13 years or over (the group where recommended amounts were highest) had less than 50 percent of the recommended amounts of dairy products. Families with children, i.e., large families, actually averaged more quarts of equivalent fluid milk than families without children, i.e., small families; but not enough more to provide the extra needs for milk products of such families.

The percentages of families with amounts of milk equivalent below 50 percent of recommendations, from 50 to 89 percent of recommendations and 90 percent or more of recommendations classified by household size were:

	Percent of recommendations		
	Below 50%	50-89%	90% or more
Less than 2 members	5	22	73
2.0 - 2.9 members	11	29	60
3.0 - 3.9 members	14	31	55
4.0 - 4.9 members	31	38	31
5.0 - 5.9 members	33	25	42
6.0 and over	56	40	4

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[14] The terms "fluid milk equivalent," "dairy products," "milk products" are used interchangeably.

[15] Ninety percent of recommended amount or more.

As shown in Table 5 the drop in percentage of families getting recommended amounts of milk products was greater with increasing family size with Negro than with white families. The differences in percentages of white and Negro families having recommended amounts of dairy products are statistically significant. It is to be noted that Negro households in this study were larger than white households.

Figures 4 and 5 give some interesting data on recommended amounts of milk products for the family and characteristics of the homemaker. As shown in Figure 4 more families get suggested amounts of these products when the homemaker drinks milk every day or every meal. More families get suggested amounts when the homemaker has more schooling. (Figure 5). The schooling groups of 6 grades or less, 7 to 9 grades, and 10 grades or over, were used since relatively few Negro homemakers had more than 10 grades of schooling. But about the same percentage of families of white homemakers with college training as with the tenth grade or more schooling had milk products in amounts recommended by nutrition specialists.

There were only 30 Negro husbands with schooling beyond the 6th grade. There was no difference in the percentage of these families having suggested amounts of milk products and those in which the husband had less schooling. The percentage of white families having milk products in recommended amounts by schooling of husband was similar to that by schooling of homemaker.

Practically all Negro families with low cash expenditures per capita per meal had less than recommended amounts of dairy products as is shown:

Per capita per meal food expense	Percent of families with recommended amounts dairy products	
	White families	Negro families
Less than 20c*	55	16
20 - 39c	64	54
40c and over	71	73

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* Difference in white and Negroes is highly significant.

SOME FACTORS AFFECTING PURCHASE OF WHOLE MILK

Data in this section of the bulletin are limited to the 331 users of purchased whole milk and to the 60 not using whole milk from any source whatsoever. In Table 6 partial regression coefficients and their standard errors between quarts of purchased whole milk used and four variables for both white and Negro families in the two larger towns (Amory and Belzoni) and the two smaller towns (Okolona and Inverness) are shown. In both white groups there was a highly significant relationship in amount of purchased whole milk used and household size. The relationship between these two was, however, not significant for Negroes in either area. This difference in whites and Negroes is no doubt related to the fact that many of the large Negro families were low income families.

In the Amory and Belzoni Negro group there was a significant relationship in amount of purchased whole milk used and income. The relationship between purchased milk used and income in Negro families of Okolona and Inverness was not significant.

Table 5. Percentage of white and Negro families having milk products in recommended amounts* by size of household report week, November-December, 1954.

Race	Number members in household			
	Less than 2	2.0 - 3.9	4.0 - 5.9	6.0 and over
No. families in group				
White**	21	153	49	11
Negro	20	88	34	29
Percent of families having suggested amounts milk products				
White	76	68	55	18
Negro	70	40	6	0

*90% or more than recommended amounts.
**Two Chinese families classified with white families.

However, this relationship approached significance.[16] A significant relationship might have been shown with a larger number of family records.

Only among Okolona and Inverness white families was the relationship in price paid per quart for whole milk and amount used found significant. Here too the quarts of other fluid milk plus canned and dried milk equivalent used decreased significantly as amount of whole milk used increased. In none of the four groups (whites and Negroes in larger and smaller towns) were multiple correlation coefficients greater than .501. This means that the partial regression coefficients did not estimate the amount of milk consumed with the desired degree of accuracy for practical prediction purposes.

The amount of whole milk used is undoubtedly a rather involved thing. Family background, experiences, tastes may play a more important role than such factors as price and income.

DIFFERENCES IN AMOUNTS OF PURCHASED WHOLE MILK USED IN LOWER AND HIGHER MILK-PRICE TOWNS

In Amory and Belzoni pasteurized whole milk (not including the Golden Guernsey) sold for 24 and 25 cents in 46 of the 49 food stores. In three stores it sold for 26c. In Okolona and Inverness it sold for 22 and 23 cents in 26 of the 28 food stores and for 24 cents in two.

Table 18 in the Appendix shows the relationship of the price of milk per quart in the area to the amount of purchased milk used by white and Negro families holding income constant. In no instance either for white families at lower and higher income levels or for Negro families at lower and higher income levels were relationships of amount used and price found statistically significant.

SUMMARY

It was the purpose of this study to determine kinds and amounts of dairy products consumed by representative families in four towns of the Prairie and Delta Areas of Mississippi, and factors affecting consumption of these. Data were obtained from 405 families and from owners or managers of 90 food stores in the four towns.

Findings of this study may be briefly summarized as follows:

Usual drink at and between meals

At all meals and seasons there were relatively more adults with a non-milk drink than a milk drink; more children

Table 6. Partial regression coefficients and their standard errors between quarts of purchased whole milk used by white and Negro families during the report week, November-December, 1954, and variable listed below.

Variables	Area and race							
	Amory and Belzoni				Okolona and Inverness			
	107 white		91 Negro		115 white		78 Negro	
	coef. reg.	standard error	coef. reg.	standard error	coef. reg.	standard error	coef. reg.	standard error
Yearly income (reported in logs)	2.889	2.145	4.069*	1.579	—3.609	2.474	2.048	1.068
Size of household	2.108**	.4009	.3173	.1710	3.270**	.5884	.0651	.1992
Qts. other fluid milk plus canned and dried milk equivalent used report week	.0614	.1786	—.05215	.1030	—1.267**	.3488	—.02070	.1281
Price paid per quart report week	—.0133	.2335	—.1554	.1350	2.574**	.8152	—.3380	.1702

*Significant at the 5% level.
**Significant at the 1% level.

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[16] In a similar analysis of these schedules and schedules of families in another study including in all 1090 families (682 white and 408 Negro), white families at income levels of under $1000, $1000-$1999, and $2000-$2999 purchased significantly more whole milk than did Negro families at the same low income levels. But at the $3000-$5000 income level there was not a significant difference in amounts of purchased milk used by whites and Negroes. See "Some Factors Affecting the Amounts of Purchased Whole Milk Used by Families" by Dorothy Dickins, Proc. Southern Agri. Workers Assoc., 1956, Marketing Section.

had a milk than a non-milk drink except at noon in summer and between meals.

Frequency of drinking milk

The majority of adults and female children **over** 6 years did not drink milk as frequently as once a day. Men had better milk drinking habits than women.

When classified by race, milk-drinking patterns of family members in different areas about the same.

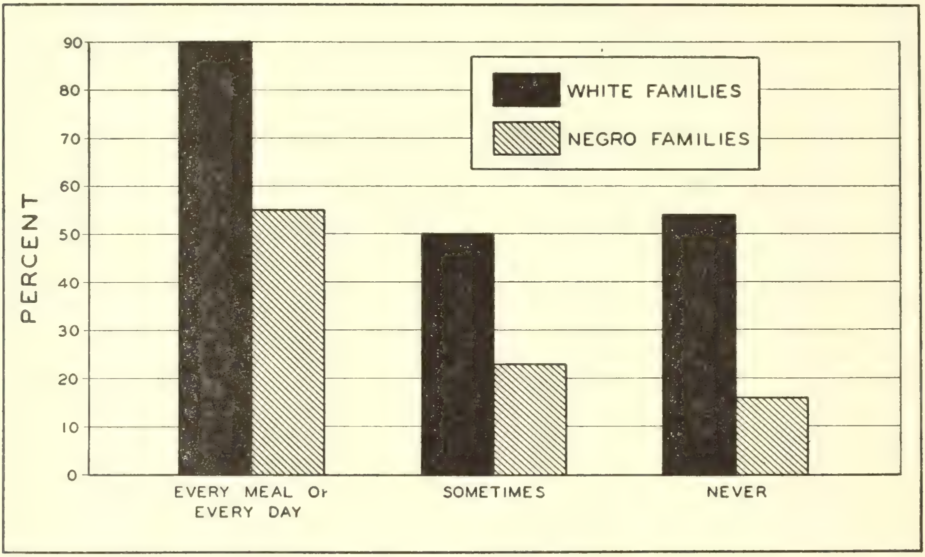

Figure 4. Percentage of white and Negro families having milk products in recommended amounts by frequency of drinking milk of homemaker in these families.

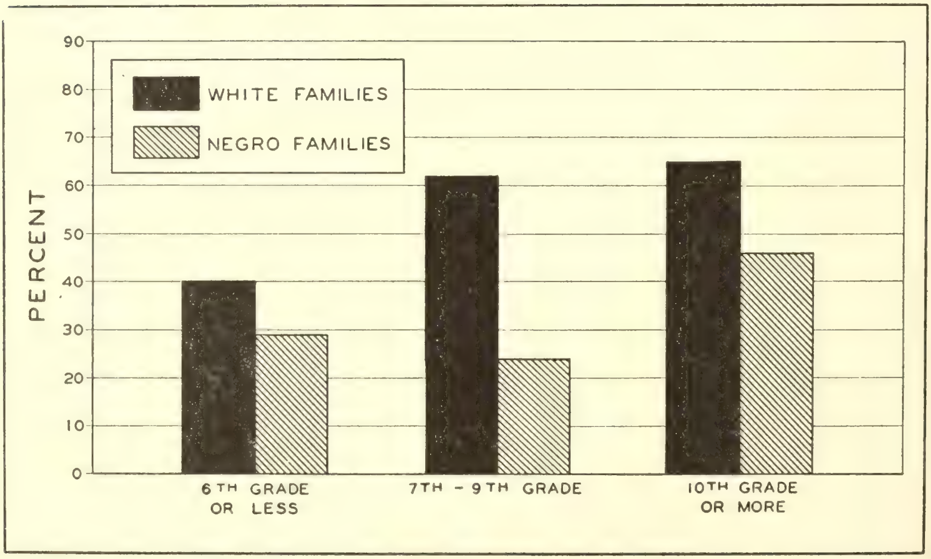

Figure 5. Percentage of white and Negro families having milk products in recommended amounts by schooling of homemaker in these families.

Differences were not found in frequency of drinking fresh fluid milk by husbands, by homemakers, and by other sex-age groups in white and in Negro families in Delta and Prairie Areas and in smaller and in larger towns.

Reasons for not drinking milk

The reason most often given for adults not drinking milk as often as once a day was "do not like," for children "costs too much." "Costs too much" was more often a reason for Negro than white children.

Most fluid milk is used for drinking

An average of 12.2 pints per family (15 for white families, 8 for Negro families) was used during report week for drinking and in infant feeding. This was 73 percent of the total fluid milk used.

Children make a difference in homemaker's milk drinking

Homemakers in families in which all members were adults drank an average of 3.0 pints during the report week; in families in which there were adults and children, 2.0 pints. Consumption of milk of husbands in the two types of families averaged the same.

Canned and dried milk used for drinking by very few

Of the 1401 family members at home during the report week there were only 45 who reported drinking dried milk; only 64 canned milk (the former were mostly by adults, the latter by young children).

Most popular dairy products

These were: sweet homogenized milk, buttermilk, evaporated whole milk, yellow cheese and ice cream.

Amount spent for dairy products

Average expenditures for dairy products used at home per family during the report week were $2.85. This amount was 16 percent of total expenditures for food at home.

Food stores carried dairy products in stock

Practically all dairy products were carried in stock by one or more stores in each of the towns surveyed. The prices for most dairy products varied considerably from store to store within a particular town.

Homemaker principal food shopper

Four out of five homemakers did some or all the food shopping.

Most perishable dairy products purchased from a food store

Three-fourths or more of the perishable products were bought from food stores. Only about one-sixth purchased sweet milk and cream from a milk plant or creamery. About one-fifth of the families purchased buttermilk and butter from local producers.

Families with a standing order of milk

Such families buy more milk but standing order families are usually white families of middle or higher income who use more milk anyway.

Frequency of purchase of dairy products

This was determined by comparing size of last purchase and amount used during the week. Thus estimated, whole milk was bought 4 or 5 times a week; buttermilk 2 times; canned and dried milk and ice cream in amounts larger than used in a week; other dairy products in about the same amounts as used in a week.

Cartons were favorite containers for milk

Most homemakers purchased milk in cartons and preferred cartons. Most preferred the quart size container.

Majority of homemakers name milk as food a family should have every day

Eighty percent named milk as one of the foods a family should have every day, but only one-fifth named milk first.

Milk especially recognized for its vitamins

When asked what milk has in it, 49 percent of the women replied vitamins, 35 percent fats, butter and/or cream; 30 percent protein, and 26 percent calcium.

Food store promotion of dairy products

About two-thirds of the managers or owners of the 90 food stores reported some type of promotion of dairy products. The promotion by the largest number was showing placards or posters by dairies, ice cream suppliers, manufacturers of canned and dried milk and cheese. But about one-half originated promotional work themselves.

New dishes with dairy products tried by homemakers

The source for suggestion of a new dish most often came from friends and from recipes in magazines, newspapers and cook books.

One-fourth of the homemakers remembered dairy products advertisements

Only 17 percent of those remembering advertisements said the advertisement had caused them to use more.

Quarts of fluid milk equivalent used and amounts compared with recommendations of nutrition specialists

Quarts of fluid milk equivalent (based on protein and calcium content) used per capita averaged 4.01. About two-thirds of the white families and one-third of the Negro families had amounts recommended for families of their composition. At the $2000 to $2999 income level there were significant differences in whites and Negroes receiving recommended amounts of fluid milk equivalent.

When classified by race, consumption of dairy products in different areas about the same.

The average per capita consumption of quarts of fluid milk equivalent of white and of Negro families in the Prairie and Delta areas and in the larger and smaller towns was about the same.

Factors affecting having recommended amounts of milk products

More families received milk products in recommended amounts when the homemaker drank milk every day. More families had recommended amounts of milk products when the homemaker had 10th grade or more schooling.

Of those families who had less than half the recommended quantity of milk products three-fourths were families with children. There was a significant negative relationship in amounts of dairy products and household size.

Chi square tests showed no association between having recommended amounts of milk products and income nor between having recommended amounts of milk products and socio-economic score for white families. Nor was there an association between income and having recommended amounts of these products for Negro families. But there was a high association between having recommended amounts and socio-economic score for Negro families.

More white than Negro families spending less than 20 cents per capita per meal for food had dairy products in recommended amounts.

Factors affecting amounts of purchased whole milk used

Some statistical relationships between quarts of purchased whole milk per household and 4 variables (income, household size, amounts of other kinds of milk used and price paid per quart for whole milk) among white and Negro families in smaller and larger towns were found. But multiple regression coefficients between purchased milk and the 4 variables in none of these four groups were great enough for prediction purposes.

IMPLICATIONS OF THE STUDY

What seem to be the implications of this study for home economists and other education specialists, for the dairy industry and for humanitarian agencies? Some implications for home economists and other education specialists are:

(1) Since about one-half of all the milk products used was in the form of fluid milk as a drink, this is the form and use that might be stressed, especially among consumers using small amounts of milk products.

(2) Since milk products other than fluid milk (as canned milk, dried milk, cheese, and ice cream) made up only about one-third of the total milk equivalent it might be well to give increased emphasis to the value of such products as well as information concerning conversion into quarts of equivalent milk in order that families

can check use against amounts recommended by nutritionists.

(3) Since consumption of milk products by Negro families was very low, ways and means of increasing their consumption need to be developed.

(4) The homemaker of the family is the person on whom milk expansion programs should be especially centered because: (a) she does all or at least part of the food shopping in most families; (b) her milk drinking habits seem related to the total consumption of milk products by her family; (c) her milk consumption was usually lower than other members of the family.

(5) The possibility of shopping around for milk products should be pointed out since price seems to vary considerably from store to store within a particular town.

(6) Appeals other than the nutritional value of milk products should be sought. Most homemakers name milk as a food their family should have evry day and know something about the nutritional value of milk.

It should be of special concern to the dairy industry that many adults report not liking the taste of milk, that owners and managers in grocery stores most often mentioned as a way to increase use of milk—improve its quality. The fact that Golden Guernsey milk can sell at a 3-cent differential shows that consumers value quality in milk. On the other hand, it may be that there are many adults who have not tasted modern homogenized milk; many who associate taste of milk with milk they had as a child. Some means of getting such adults to taste modern milk need to be devised.

This study shows the desirability of assisting grocers in merchandizing of dairy products, including furnishing of appropriate promotional material.

With an increasing number of families having refrigerators with a freezing section and home freezers, there might well be more promotion of the one-half gallon container of ice cream.

It would seem that two quarts of milk fastened together with an easy-to-carry handle would meet greater consumer acceptance than the one-half gallon container.

Factors other than nutritional value are important also in purchase of milk. More attention needs to be given to decision-making processes as related to the purchase of dairy products.

This study points up the need for working with home economists to see that recipes in newspapers, magazines, cook books, fully utilize dairy products. It also shows the need for more promotion programs directed towards adults, especially towards women.

This analysis shows that there are large numbers of low income Negro families and large numbers of families with children who use relatively small amounts of milk products per person. Some form of government subsidy might well be offered these groups.

APPENDIX

Socio-economic Scale

Col. No.			Encircle score
1.	Do you have a TV set?	Yes	2
		No	0
2.	Do you have a radio?	Yes	2
		No	0
3.	Do you have a telephone?	Yes	2
		No	0
4.	Do you have a home freezer?	Yes	2
		No	0
5.	What kind of refrigerator do you have?	Electric, Gas or Kerosene	2
		Ice	1
		Other or none	0
6.	Do you have an automobile or truck?	Yes	2
		No	0
7.	Do you take a newspaper?	Daily paper	2
		Weekly paper	1
		Neither	0
8.	Does homemaker read regularly paper or magazine with a food section?	3 or more	2
		1 or 2	1
		None	0
9.	Do family members participate in one or more organizations?	All members 6 years and over in 1 or more organizations other than church	2
		Part members 6 years and over in 1 or more organizations other than church	1
		All or part in church only or in no organizations	0

TOTAL SCORE - ______

Table 1. Percentage of families having specified scores in socio-economic scale by socio-economic group classification.*

Col. No.	score	Socio-economic groups 0 - 3	4 - 6	7 - 10	11 - 14	15 - 18
T.V.	2	0	1	9	26	85
	0	100	99	91	74	15
Radio	2	71	94	98	99	100
	0	29	6	2	1	0
Telephone	2	0	9	51	95	100
	0	100	91	49	5	0
Home freezer	2	0	1	6	20	72
	0	100	99	94	80	28
Refrigerator	2	9	82	92	99	100
	1	64	14	7	1	0
	0	27	4	1	0	0
Auto or truck	2	2	34	60	91	100
	0	98	66	40	9	0
Newspaper	2	0	9	61	89	100
	1	2	2	7	4	0
	0	98	89	32	7	0
Food section	2	0	0	3	22	58
	1	4	16	40	64	38
	0	96	84	57	14	4
Organizations	2	0	8	7	30	62
	1	4	21	34	41	38
	0	96	71	59	29	0
Total families		45	80	108	112	60

*Ten percent of the families had less than 2 members in household during report week, 60 percent from 2.0 - 3.9 members, 20 percent from 4.0 - 5.9 members, and 10 percent 6 or more members; no husband and 2 percent of the homemakers were under 20 years; 32 percent of the husbands, 40 percent of the homemakers were 20 - 39 years, 44 percent of the husbands and 42 percent of the homemakers were 40 - 59 years and 24 percent of the husbands and 16 percent of the homemakers were 60 years and over. In 17 percent of the families there was no husband.

Thirty percent of the husbands and 24 percent of the homemakers had 6 grades schooling or less, 30 percent of the husbands and 35 percent of the homemakers had completed from 7 - 11 grades, 38 percent of the husbands and 41 percent of the homemakers had a high school education or more, 23 percent of the husbands and 22 percent of the wives had schooling in addition to high school. In 17 percent of the families there was no husband. In 2 percent of the families the schooling of the husband was not reported.

Table 2. Usual drink of adults in the 232 white and 171 Negro families at and between meals by season.

Meal and season	Usual drink							
	Nothing		Milk only		Non-milk only		Milk and non-milk	
	White	Negro	White	Negro	White	Negro	White	Negro
	%	%	%	%	%	%	%	%
Breakfast								
Winter	1	12	1	4	88	76	10	8
Summer	1	17	2	4	85	66	12	13
Noon Meal								
Winter	8	40	11	16	52	29	29	15
Summer	2	29	3	5	81	54	14	12
Evening meal								
Winter	6	36	24	21	32	21	38	22
Summer	6	33	15	11	52	42	27	14
Between-meals								
Winter	16	58	2	2	70	38	12	2
Summer	13	38	1	1	76	59	10	2

Table 3. Usual drink of children in the 140 white and 102 Negro families with children at and between-meals by season.

	Usual drink							
	Nothing		Milk only		Non-milk only		Milk and non-milk	
Meal and season	White	Negro	White	Negro	White	Negro	White	Negro
	%	%	%	%	%	%	%	%
Breakfast								
Winter	4	22	64	50	22	22	10	6
Summer	4	36	63	33	25	25	8	6
Noon meal								
Winter	6	34	71	41	16	18	7	7
Summer	1	24	38	24	55	46	6	6
Evening meal								
Winter	4	32	80	51	11	12	5	5
Summer	4	30	58	31	32	33	6	6
Between meals								
Winter	16	51	25	19	52	25	7	5
Summer	9	32	13	12	73	49	5	7

Table 4. Frequency of drinking fresh fluid milk by members of the 232 white families in four towns, Mississippi.

Family members	Total No. members	Every meal	Every day	Sometimes	Never	Total
		%	%	%	%	%
Husbands	212	8	45	34	13	100
Homemaker	232	3	32	38	27	100
Other adults, family members	67	8	42	37	13	100
Males under 6	45	56	29	6	9	100
Males 6 - 12	48	33	50	15	2	100
Males 13 - 15	21	0	86	9	5	100
Males 16 - 19	21	14	76	10	0	100
Females under 6	44	39	34	11	16	100
Females 6 - 12	50	24	58	12	6	100
Females 13 - 15	15	7	40	46	7	100
Females 16 - 19	14	0	64	22	14	100

Table 5. Frequency of drinking fresh fluid milk by members of the 171 Negro families in four towns, Mississippi.

Family members	Total No. members	Every meal	Every day	Sometimes	Never	Total
		%	%	%	%	%
Husbands	122	2	26	52	20	100
Homemakers	170	1	25	59	15	100
Other adults, family members	72	4	24	55	17	100
Males under 6	51	15	24	35	26	100
Males 6 - 12	47	2	30	68	0	100
Males 13 - 15	15	7	20	60	13	100
Males 16 - 19	16	0	38	56	6	100
Females under 6	59	12	29	37	22	100
Females 6 - 12	53	6	9	77	8	100
Females 13 - 15	20	10	25	60	5	100
Females 16 - 19	14	0	14	79	7	100

Table 6. Percentage of white family members drinking fresh fluid milk at home and average amount drunk by those drinking, report week, November-December, 1954.

Family members	Total No. families	Percent who drank fresh fluid milk	Average amount drunk by members (pts.)
Husbands	212	73	6.5
Homemakers	232	59	4.2
Other adults, family members*	64	69	5.2
Males under 6	45	87	9.2
Males 6 - 12	48	98	7.2
Males 13 - 15	21	95	7.4
Males 16 - 19*	18	100	8.2
Females under 6	44	77	8.0
Females 6 - 12	50	92	6.0
Females 13 - 15	15	93	4.2
Females 16 - 19**	10	70	5.0

*3 persons absent during report week.

**4 persons absent during report week.

Table 7. Percentage of Negro family members drinking fresh fluid milk at home and average amount drunk by those drinking report week, November and December, 1954.

Family members	Total No. families	Percent who drank fresh fluid milk	Average amount drunk by members (pts.)
Husbands	122	62	4.0
Homemakers	170	63	3.3
Other adults, family members*	69	48	3.0
Males under 6	51	57	3.0
Males 6 - 12	47	81	2.8
Males 13 - 15	15	73	3.0
Males 16 - 19**	15	67	4.2
Females under 6	59	69	4.0
Females 6 - 12	53	79	2.6
Females 13 - 15	20	80	2.8
Females 16 - 19***	13	77	1.8

*3 persons absent during report week.
**1 person absent during report week.
***2 persons absent during report week.

Table 8. Percentage family members eating one or more meals not from family supply, average number of meals for those away and total pints fresh fluid milk drunk away during report week, November-December, 1954.

Family members	Total number families	Percent eating 1 or more meals away	Average No. meals for those away	Total pints drunk not home supply
Husband	336	36	3.7	17.5
Homemaker	404	34	3.9	19.0
Other adults, family members	133	32	5.3	3.0
Males under 6	98	17	2.7	4.5
Males 6 - 12	96	39	4.0	53.5
Males 13 - 15	36	39	3.4	13.0
Males 16 - 19	34	50	6.2	24.0
Females under 6	104	14	2.6	4.5
Females 6 - 12	103	41	3.9	56.0
Females 13 - 15	36	37	4.7	16.5
Females 16 - 19	23	30	3.9	2.5

Table 9. Frequency of use of dairy products and source, amounts, and cost of those used during the week preceding the interview, 405 families, Mississippi towns.

Product	Used past week	Not past week but past year	Not past year but have used	Never used	Number families using past week	Source (No.)			Average used by those using	Average expense per family buying
						B	HP	O		
	%	%	%	%						Dollars
Fresh fluid milk										
Sweet homogenized	75	17	4	4	304	303	—	1	7.4 qts.	1.75
Sweet pasteurized	6	46	37	11	24	24	0	0	6.5 qts.	1.53
Sweet whole raw	7	23	43	27	29	18	6	5	7.6 qts.	1.21
Sweet skimmed	*	5	16	79	2	1	0	1	5.0 qts.	1.02
Buttermilk (sour)	63	28	7	2	254	237	1	16	3.1 qts.	.46
Chocolate milk or drink	4	38	17	41	15	15	0	0	1.7 qts.	.40
Fresh cream										
Whipping	11	52	9	28	46	43	1	2	1.7 (½ pt.)	.52
Coffee cream	*	9	9	82	2	2	0	0	2.0 (½ pt.)	.42
Half and Half	4	10	6	80	16	16	0	0	1.5 pts.	.37
Canned milk										
Evaporated whole	48	37	9	6	194	193	—	1	38.6 oz.	.41
Evaporated skim	1	1	1	97	3	3	—	0	13.3 oz.	.08
Condensed	5	62	15	18	22	22	—	0	17.3 oz.	.35
Dry milk										
Skim, non-fat	15	27	13	45	62	59	—	3	12.4 oz.	.28
Cream	1	8	3	88	4	4	—	0	1.5 oz.	.14
Malted	1	7	5	87	3**	3	—	0	.2 oz.	.38
Cheese										
Yellow	62	36	1	1	252	251	0	1	.9 lbs.	.55
Cottage	5	36	11	48	20	20	0	0	1.03 pts.	.32
Cream cheese	4	45	9	42	16	16	—	0	6 oz.	.31
Spread	4	39	6	51	15	15	—	0	4.5 oz.	.20
Frozen										
Ice cream	32	66	1	1	129	128	—	1	1.6 qts.	.75
Sherbet	2	65	10	23	10	10	—	0	.96 qts.	.48
Ice milk	3	28	4	65	12	12	—	0	1.25 qts.	.38
Butter	28	36	28	8	115	95	4	16	.83 lbs.	.59

*Less than .5%.

**One family used in addition two pounds of dried milk formula.

Table 10. When specified dairy products used during past year were most used.

Dairy product	No. using past year	Percent reporting used most: In winter	In summer	No difference
Fluid milk				
Sweet homogenized	373	13	10	77
Sweet pasteurized	211	4	6	90
Sweet whole raw	123	6	6	89
Sweet skimmed	22	9	5	86
Buttermilk	370	6	5	89
Chocolate milk	168	8	20	72
Fresh fluid cream				
Whipping cream	266	11	24	65
Coffee cream	40	18	5	78
Half and Half	55	9	7	84
Canned milk				
Evaporated whole	342	6	9	85
Evaporated skim	9	0	22	78
Condensed	271	7	23	70
Dry milk and cream				
Skim, non-fat	177	4	7	89
Dry cream	37	5	8	86
Cheese				
Yellow	393	7	4	89
Cottage	167	2	22	75
Cream	196	7	14	80
Frozen				
Ice cream	394	0	81	19
Sherbet	271	0	92	8
Ice milk	124	2	82	17
Butter	259	5	4	91

Table 11. Per family weekly consumption of milk and its products by families in this study compared with findings from some other studies where similar data were obtained.

Dairy products	Miss. 4 towns 1954 Nov., Dec.	Miss.[1] farm families Delta, 1948	Va.[2] Danville 1954	USDA [3] Birmingham 1948	North [4] Carolina Urban 1950	South [5] Carolina open country families, 1955
Whole sweet milk, qts.	6.48	4.54	6.57	4.31	6.69	7.54
Buttermilk, qts.	1.94	7.83	1.86	2.04	1.69	4.68
Evaporated milk, lbs.	1.16	1.24	2.62	2.28	3.15	4.88
Dry milk, lbs.	.12	.01	.06	.18	—	.14
Cheese (excludes cottage) lbs.	.59	.23	.59	.68	.54	.67
Butter, lbs.	.24	1.05	.58	.28	.75	.92

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[1] Moser, Ada, et al. Family Food Consumption in Three Types of Farming Areas of the South II. An Analysis of Weekly Food Records, Late Winter and Early Spring, 1948. Southern Cooperative Series Bulletin 20, November 1951.

[2] Dean, Willamay, et al. A Study of the Marketing & Use of Dairy Products and Some Influencing Factors. Va. Agri. Exper. Sta. Bull. (in press) 1956.

[3] U. S. Department of Agriculture: Family Food Consumption in Birmingham, Alabama, Winter 1948. FE 685, 1948 Food Consumption Survey, Preliminary Report No. I., Nov., 1948.

[4] Cotton, Walter P. Consumption of Dairy Products in Urban North Carolina, N. C. Agri. Exper. Sta. Bull. No. 371, pg. 8, August 1950.

[5] Moser, Ada, et al. Foods Used by Open Country Families York County South Carolina. S. C. Agri. Exper. Sta. Bull. 428, June 1955.

Table 12. Grocery stores in which the 405 families had bought some food during the past week and grocery stores which were the major source of the food supply by distance from home and nearness to work, whether credit or delivery used, classified by area and race.

Item	Larger towns		Smaller towns		
	White families	Negro families	White families	Negro families	Chinese families
No. families	112	91	120	80	2
Total No. groceries named	267	153	195	108	2
Average No. per family named	2.38	1.68	1.63	1.35	1.00
	Description of the groceries named				
	%	%	%	%	No.
Location*					
Less than 1 mile or 8 blocks	85	91	54	57	2
1.0 - 2.0 miles, or 8 to 16 blocks	1	7	41	42	0
2.1 miles or more; or 17 or more blocks	14	2	4	1	0
Used credit	19	49	30	42	0
Used delivery	7	4	25	16	0
Near work	4	1	4	4	1
No. families who named 1 major source of food supply	105	88	104	79	2
	Description of the major source of food supply				
	%	%	%	%	No.
Location*					
Less than 1 mile or 8 blocks	83	87	45	64	2
1.0 - 2.0 miles, or 8 to 16 blocks	1	7	39	35	0
2.1 miles or more; or 17 or more blocks	15	3	2	0	0
Used credit	30	57	32	55	0
Used delivery	7	4	24	19	0
Near work	7	1	3	5	1

*In 2 stores named by white smaller town families no report is given as to distance.

Table 13. Replies of homemakers when asked what milk has in it.*

What milk has in it	Larger towns		Smaller towns**	
	White families	Negro families	White families	Negro families
	%	%	%	%
Vitamins; all the vitamins	37	55	48	63
Fats, butter, cream	44	13	48	28
Calcium or lime	50	4	43	9
Protein	31	12	39	22
Water; mostly water	24	12	38	29
Don't know	5	12	6	19
It's nutritious; lots of food value	11	4	9	10
Minerals	11	2	3	9
Derogatory statements***	0	13	0	1
Builder of bones and teeth	9	0	1	3
Iron	3	1	3	5
Energy and strength	3	1	3	1
Vitamin D	5	2	0	0
Vitamin B	2	1	2	1
Value for building; everything for growing	4	0	0	1
Glucose; sugar	1	2	0	2
Vitamin A	1	2	1	0
Vitamin C	1	0	2	0
Starches	1	0	1	0
Calories; 67 calories	1	0	1	0
Milk powder; milk	1	1	0	0
Carbohydrates	0	0	1	0
McMillan's feed	0	0	1	0
Grade A more sanitary	0	0	1	0

*Will not add up to 100% since some gave more than one reply.

**The two Chinese families replied "fats, butter, cream" and "It's nutritious—lots of food value."

***Germs, bacteria, worms.

Table 14. Average per capita consumption of fluid milk equivalent report week of Prairie and Delta town families, November-December, 1954.

Per capita consumption	Prairie towns		Delta towns	
	White	Negro	White	Negro
	%	%	%	%
Less than 2 quarts	8	29	4	35
2.0 - 3.9 quarts	33	40	44	39
4.0 - 5.9 quarts	29	17	31	18
6 quarts and over	30	14	20	8
Number families	138	63	97	108

Table 15. Per capita consumption of dairy products (fluid milk equivalent) during report week of white and Negro families by income, November-December, 1954.

Per capita consumption dairy products	Net income							
	Under $1000		$1000 - $2499		$2500 - $3999		$4000 and over	
	White	Negro	White	Negro	White	Negro	White	Negro
	No.*	%	%	%	%	%	%	No.*
Less than 2 qts.	2	32	11	35	4	28	4	0
2.0 - 3.9 qts.	5	40	41	41	29	22	40	1
4.0 - 5.9 qts.	1	15	24	14	39	28	29	4
6.0 and over	1	12	24	10	28	11	27	0
Total No.	9	65	37	83	69	18	119	5

*Numbers only are shown since less than 10 cases.

Table 16. Relation of net income to percentage of recommended amounts of milk products received (chi square tests).

Percentage of recommended amounts	Under $2000		$2000 - $2999		$3000 & over		Total families	
	No. families		No. families		No. families		No. families	
	White	Negro	White	Negro	White	Negro	White	Negro
Under 50%	6	50	3	8	12	2	21	60
50 - 89%	9	40	7	15	48	5	64	60
90 - 109%	3	9	7	1	28	1	38	11
110% and over	11	27	21	8	79	5	111	40
Total	29	126	38	32	167	13	234	171

(1) White families 3 income levels
$X^2 = 8.2682$
P .3 — .2 (No assoc.)
(2) Negro families 3 income levels
$X^2 = 7.0161$
P .5 — .3 (No assoc.)
(3) White and Negro families 3 income levels
$X^2 = 53.1755$
P less than .01 (highly significant)
(4) White and Negro families under $2000
$X^2 = 5.2951$
P .2 — .1 (No assoc.)
(5) White and Negro families $2000 - $2999
$X^2 = 15.1084$
P less than .01 (highly assoc.)
(6) White and Negro families $3000 and over
$X^2 = 2.2470$
P .7 — .5 (No assoc.)

Table 17. Relation of socio-economic score of white families to percentage of recommended amounts of milk products received (chi square tests).

Percentage of recommended amounts	6 and under		7 - 10		11 - 18		Total	
	No. families		No. families		No. families		No. families	
	White	Negro	White	Negro	White	Negro	White	Negro
Under 50%	3	50	7	10	11	0	21	60
50 - 89%	3	35	17	20	44	5	64	60
90 - 109%	1	6	10	4	27	1	38	11
110 and over	6	21	26	14	79	5	111	40
Total	13	112	60	48	161	11	234	171

(1) White families 3 socio-economic levels
$X^2 = 5.2091$
P .7 — .5 (No assoc.)
(2) Negro families 3 socio-economic levels
$X^2 = 15.5504$
P .02 — .01 (highly assoc.)
(3) White and Negro families 3 socio-economic levels
$X^2 = 70.2931$
P less than .01 (highly significant)
(4) White and Negro families 6 and under
$X^2 = 5.6841$
P .2 — .1 (No assoc.)
(5) White and Negro families 7 - 10
$X^2 = 5.6777$
P .2 — .1 (No assoc.)
(6) White and Negro families 11 - 18
$X^2 = 2.3404$
P .7 — .5 (No assoc.)

Table 18. Relation of the price of mik per quart in most groceries to amount of purchased milk used by white and Negro families classified by income. (chi square tests).

(a) WHITE FAMILIES

Milk prices in most groceries*	Income under $4000		
	10 quarts or less	More than 10 quarts	Total
	No. families	No. families	No. families
24 - 25	37	14	51
22 - 23	47	18	65
Total	84	32	116

X^2 .0325
P .95 - .90 (no association)

(b) WHITE FAMILIES

Milk prices in most groceries*	Income $4000 and over		
	10 quarts or less	More than 10 quarts	Total
	No. families	No. families	No. families
24 - 25	41	20	61
22 - 23	30	27	57
Total	71	47	118

X^2 2.0412
P .20 - .10 (no association)

(c) NEGRO FAMILIES

Milk prices in most groceries*	Income under $1300		
	4 quarts or less	More than 4 quarts	Total
	No. families	No. families	No. families
24 - 25	32	8	40
22 - 23	36	8	44
Total	68	16	84

X^2 .004387
P .95 - .90 (no association)

(d) NEGRO FAMILIES

Milk prices in most groceries*	Income $1300 and above		
	4 quarts or less	More than 4 quarts	Total
	No. families	No. families	No. families
24 - 25	36	15	51
22 - 23	25	11	36
Total	61	26	87

X^2 .01580
P .95 - .90 (no association)

*The price level of 24 - 25 cents per quart was in Belzoni and Amory; that of 22 - 23 cents in Okolona and Inverness. Data was collected in November and December of 1954.

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Industrialization and a Market For Food Products in the Natchez Trade Area

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

JUL 9 1956
MI[illegible] STATE

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THANKS ARE DUE TO THE FAMILIES AND MERCHANTS WHO FURNISHED INFORMATION FOR THIS STUDY AND TO THE LOCAL WOMEN WHO ASSISTED IN OBTAINING DATA FROM HOMEMAKERS: TO THE MANAGER OF THE NATCHEZ ASSOCIATION OF COMMERCE: AND TO THE COUNTY AND HOME DEMONSTRATION AGENTS IN ADAMS COUNTY, MISSISSIPPI, AND CONCORDIA PARISH, LOUISIANA, FOR THEIR HELPFULNESS.

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Industrialization and A Market For Food Products In the Natchez Trade Area

By

Dorothy Dickins, L. D. Welch, Virginia Ferguson and W. E. Christian

INTRODUCTION

This bulletin reports on one of the surveys made to provide basic information for sound programs to expand markets for locally produced foods in industrial areas. To what extent has such industrialization helped local farmers by furnishing more markets for food products? Are there other possibilities for increased benefits to farmers? These are some of the questions with which the report is concerned. Market and family data are related to help answer these questions.

The report includes information from retailers and processors handling milk, pork, broilers, beef, eggs, leafy vegetables, sweet potatoes and tomatoes. It also includes information from representative families in the Natchez trade area concerning food consumption practices and preferences regarding these foods.

The Natchez area was selected as the locale for one of these studies for the reason that it is one of the state's most recently industrialized areas as well as one of its most rapidly growing urban centers. For the purposes of this study employment in manufacturing industries is taken as a measure of industrialization. Latest available Department of Commerce statistics indicate that Adams County ranked sixth in the state in 1953 in manufacturing employment, being exceeded in this respect (with one exception) only by counties of much larger population. The industrial development of the Natchez area has been accompanied by an impressive shift in the population from rural to urban areas. Census data reveal that the urban population of the county increased by 48.7 percent from 1940 to 1950, while the rural population underwent a 20.3 percent decline during the same period. In planning the study it was felt that these dynamic conditions would well serve to bring to the fore any impact which recent industrial development of an area might have on the market for locally produced food products.

There were twice as many manufacturing workers as farmers residing in Adams County in 1950. Census data for that year show that 23 2 percent of the total of employed persons in the county were employed in manufacturing jobs, while only 11.5 percent were employed in farming. The current proportion of manufacturing workers to farmers is perhaps much greater, since one of the area's largest industrial plants did not begin operations until after the 1950 census was taken.

The establishment of two major wood processing industries in Natchez in 1948 and 1950 has meant that much of the industrial development has been built around the forest resources of the area, with firms engaged in the manufacture of timber products providing more than two-thirds of the jobs in manufacturing. But the processing of other products also provides employment for large numbers of workers in Natchez. Two of the larger plants in this group are a tire and tube manufacturing plant, at which an average of 751 workers were employed in 1954, and a garment plant, with a 1954 average employment of 161.

Employment statistics more recent, and perhaps more meaningful, than the census data referred to earlier in this discussion, are shown in Appendix Table 1. The upper section of this table shows the average number of workers, by manufacturing industries, in Adams County firms covered by the Mississippi Employment Security Law each year, 1950-54. It should be pointed out that figures in the table do not necessarily represent complete totals of all manufacturing workers, since a firm is not necessarily covered by the law unless it employs eight or more workers at least 20 weeks in the year. A look at this section of the table discloses that while some industries have experienced decreases in employment since 1950, these decreases have been more than offset by the dramatic increase in pulp and paperboard mill employment. The second and third sections of the table list total payrolls and average wage paid per worker by the various manufacturing industries. Manufacturing payrolls increased by more than $3.5 million from 1950 to 1954, and yearly wage per worker showed a net gain of $849, or 30 percent above the 1950 figure.

One factor, not discernable from a table of average annual employment data, but important to the economy of an area, is the seasonality of employment. Figure 1 shows remarkably little seasonal difference in manufacturing employment in Adams County. As indicated in the lower sections of this graph, only one major industry group, lumber, varied from its yearly average level of employment by as much as 5 percent in any month. The relative stability of the employment level in the larger industrial groups, pulp and paperboard, lumber, and tires, tends to offset a somewhat higher degree of seasonality found in the smaller industries. The net result is a fairly constant level of employment in all manufacturing industries in the county throughout the year.

The trend in agriculture in the county has been the reverse of that found in industrial employment within recent years. Farm numbers declined by 4.2 percent in the 4 years 1950 to 1954, and by 29.6 percent from 1945 to 1954. Preliminary data of the 1954 Census of Agriculture show the number of farms in the county in 1954 as 1,026. Of this number only slightly more than 46 percent were commercial farms, while 22 percent were part-time, and 31 percent were "residential" farms, or farms from which the value of products sold was less than $250. Although there are many relatively large farms in Adams County, the most commonly found unit was of less than thirty acres in size in 1954. Three hundred and sixty-three of the 481 commercial farms were cotton farms, i.e., cotton provided the major source of farm income. Beef cattle are being used as supplementary enterprises on an increasing number of these farms, as evidenced by increases in 1954 over 1949 in both number of farms selling, and number of animals sold. In contrast, there has been a drastic decline in both hog production and dairying during the same period, with decreases of more than 50 percent both in number of farms selling these products, and in quantities sold. The number of farms reporting vegetables for sale also dropped by more than 50 percent between census years. Taken in aggregate, these changes should indicate greater market potentials for those farmers who continue to produce food products for the local market.

THE FAMILY SURVEY

Two hundred and fifty-three families in Natchez or within a 10-mile radius of Natchez were interviewed during June 1954. Twenty-eight of these families lived in Concordia Parish, Louisiana, across the river from Natchez; the remainder lived in Adams County.[1] One hundred and twenty-five of the families lived in Natchez, henceforward designated as the **Urban Area;** and 128 lived within a 10-mile radius of the city, henceforward designated as the

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[1] It is assumed that families in the Louisiana sample are similar to those in certain rural areas of Adams County. In order words, estimates for Adams County are based on data from Adams County families and include a few Louisiana families.

Rural Area.

Dr. Earl E. Houseman, Statistical Assistant, Office of Marketing Services in the U. S. Department of Agriculture, drew the areas in which the rural interviewing was to be done in such a way that a representative sample of all families in the area were visited. Rural areas were sampled at the rate of 1/21, 1/6, 1/8, 1/2, 1/2, and 1/2, respectively.

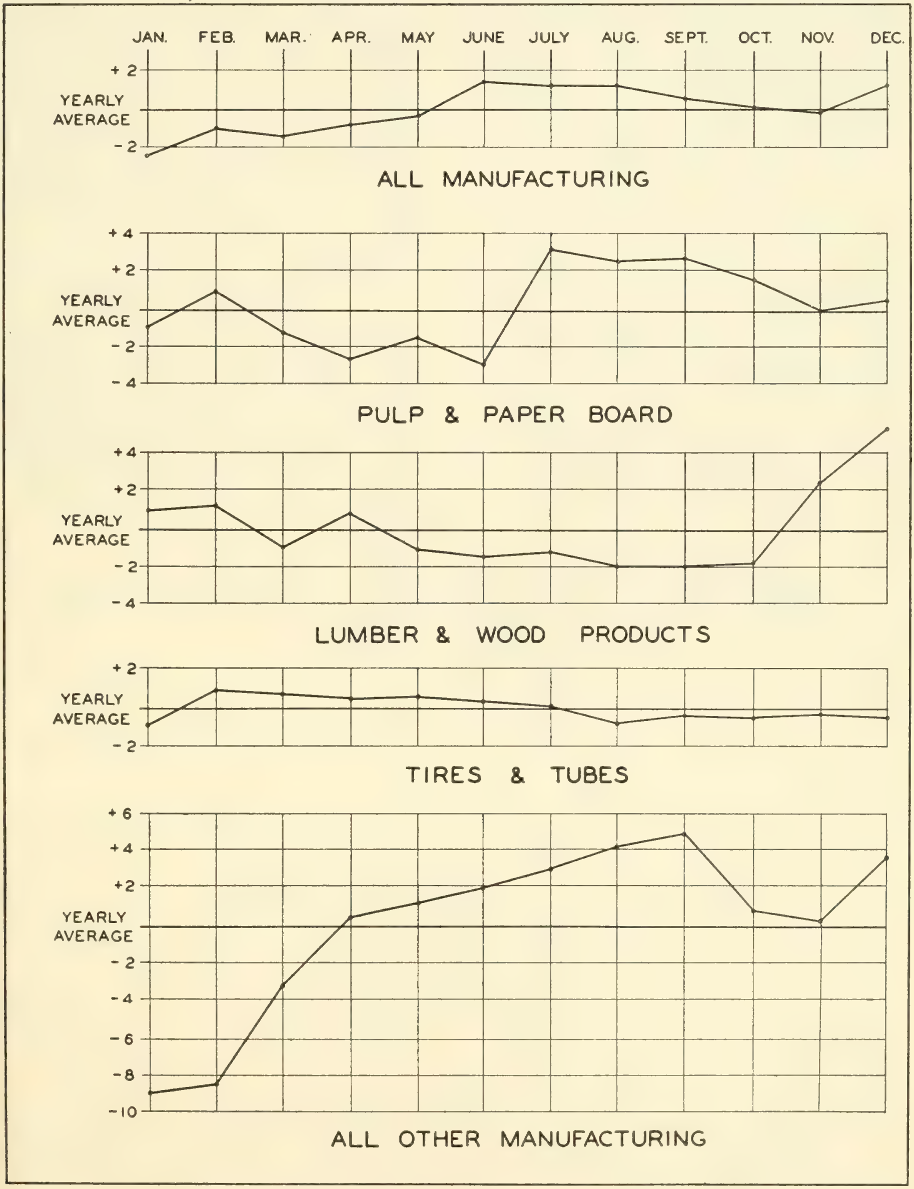

Figure 1. Average monthly variation in manufacturing employment, Adams County 1950-53.

The first area included a large housing subdivision that had developed since the last census.

The urban sample was drawn from the Natchez City Directory. One in every 26 names was drawn. Data were obtained, however, from only those families who had two or more members who ordinarily had at least one meal per day in the home together. It is this type of family that is most important from the consumer market viewpoint. Likewise, families in existence less than one year were not surveyed since it was necessary to relate consumer market data to annual family income.[2]

Supplementary data were obtained by questionnaire from 33 percent of the urban and 40 percent of the rural sample in September, 1954. Urban families returning the questionnaire had slightly higher average incomes than families in the corresponding sample; but rural families returning it had slightly lower average incomes.

Description of the Families

The rural and urban samples differed in certain respects. More urban than rural families were white families and small families. Fifty-five percent of the urban and 41 percent of the rural families were white families. The average size of the two groups was 3.64 and 4 48 members, respectively. In 14 percent of the urban sample and 17 percent of the rural sample, the family heads were 60 years of age or more.

Both husbands and wives in urban families had much more schooling than those in rural families. The percentage of families with husbands and wives who had completed high school or attended college was:

	Urban	**Rural**
Husbands	37%	16%
Wives	41%	16%

Likewise, more husbands and wives in rural families had not completed grammar school. The percentage of families having husbands and wives with this little schooling was:

	Urban	**Rural**
Husbands	29%	53%
Wives	18%	48%

There are two types of facilities which are closely related to shopping habits of the consumer-buyer. These facilities are communication and refrigeration. The percentage of families having specified facilities of these two types is shown in Figure 2.

Source and Distribution of Family Income

From what sources did urban and rural families obtain their incomes? What were family incomes the year preceding the interview (1953-54)? What members had had off-farm work experience? Answers to questions such as these give basic background information for understanding the local food marketing situation.

More families in both urban and rural samples received income from off-farm earnings than any other source, as is shown:

Families with:	**Urban**	**Rural**
Income from farm operation	3%	41%
Income from off-farm earnings	94%	79%
Income from other sources	34%	31%

Income from "other sources" includes income from pensions, welfare payments, interest, net from rental property and the like. Percentages in the above summary total more than 100 because some families received income from more than one of these sources.

Figure 3 shows the distribution of urban and rural families by net cash income.[3] As will be noted, a slightly greater percentage of families both in the urban and the rural samples had incomes of $1000 - $2999, but the big difference in incomes of urban and rural families is found at higher and lower income levels. About one-fourth of the urban families had incomes of $5000 and over, and about one-seventh under $1000. For rural families, about one-fourth had incomes under $1000 and about one-seventh incomes of $5000 and over.

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[2] There were 203 addresses with 185 families in the Natchez sample and 176 dwellings with 153 families in the rural sample. In Natchez 18 of the addresses were vacant, could not be located, or were business addresses only. Forty-four of the 185 families were ineligible; homemakers in 16 families could not be contacted, were unable or unwilling to participate. In the rural sample 23 of the 176 dwellings were vacant at the time of the interview; 19 families were ineligible; and homemakers in 6 families could not be contacted, were unable or unwilling to participate.

[3] In a few cases where income was not obtained, the family was placed in an income class on the basis of kind of work and other type of socio-economic data that could be obtained.

When the urban families are arranged by net money income from the lowest to the highest the income of the middle family was $3120. When the rural families are thus arranged income of the middle family was considerably less—$1866. But there was a difference in the middle income rural family who operated a farm and the middle income family who did not. The income of the middle farm operator family was $979; that of the rural non-farm family $3094. It would seem that in spite of industrial development the farmer still lags behind in returns for his labor.

Income per capita (1953-54) was figured for Adams County using as a basis incomes of the 253 families included in the survey. Thus figured average per capita income was $1004.

To understand the occupational situation of an area it is necessary not only to know the income and the proportion of families deriving income from different sources, but also to know the main occupation of the family head, wife, and other employed family members.

As is known, some persons have more than one occupation; that is, they are farm operators and have work off the farm also. Listed below is the proportion of families in the survey with specified members having as their main occupation work other than farm operation. Also shown is the percentage of those engaged in non-farm work who had jobs in manufacturing.

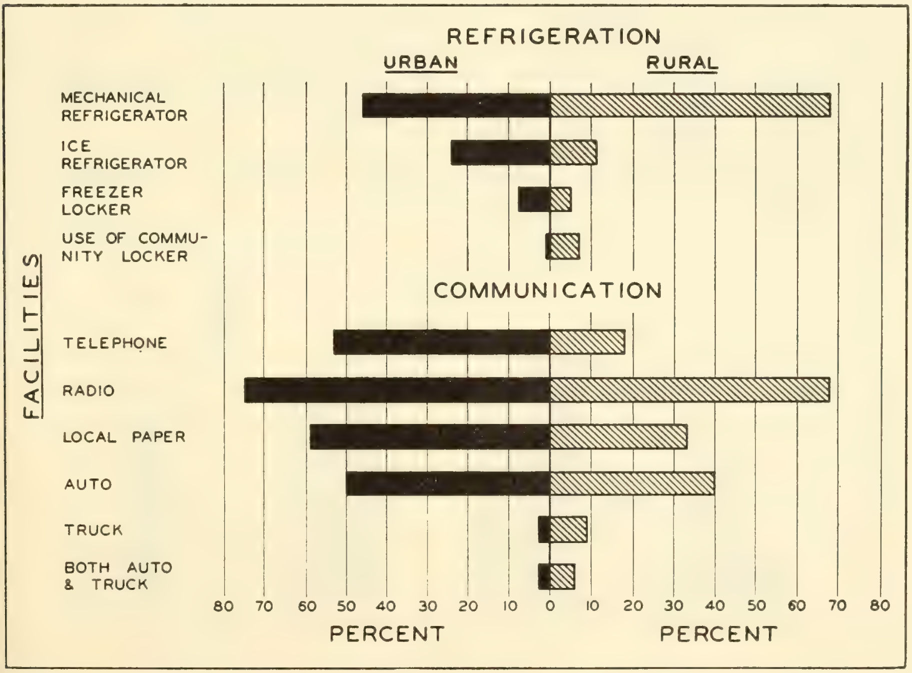

Figure 2. Percentage of urban and rural families with specified refrigeration and communication facilities.

	Non-farm	Non-farm Mfg.
Urban		
Husband (or male head)	87%	21%
Wife (or female head)	25%	12%
One or more others in family	13%	8%
Rural		
Husband (or male head)	52%	52%
Wife (or female head)	9%	0%
One or more others in family	12%	42%

The most interesting fact about this tabulation is the high proportion of rural families with husbands and other members engaged in non-farm work who had manufacturing work.

There were in the families surveyed many more who had had non-farm work experience than were engaged in non-farm work in June, 1954. Ninety-eight percent of the husbands in the urban sample and 78 percent in the rural sample had done non-farm work of some kind at one time. Sixty-three percent of the wives in the urban sample and 59 percent in the rural sample had done work of this type since marriage.

Consumer Shopping Habits

Urban families spent an average of $271 per capita for food; rural families, $170. The highest per capita food expense by an urban family was $700, the lowest by a rural family $41. Food expenditures were figured for the county using as a basis expenditures of the 253 families. Thus figured averaged per capita expenditures were $246.

The 253 survey families spent an average of 24.5 percent of their income for food. This is slightly under the proportion of the retail dollar (using retail sales in Adams County compiled from Tax Commission reports spent for food in 1954. (See Figure 4).[4] Increases in the percentage of the consumer's dollar spent for food in 1954 over the five-year average indicate an increasing dependency upon the market for the food supply.

Grocery stores used: Rural families traded at fewer grocery stores than did urban families. The percentage of families mentioning specific numbers of groceries at which they traded was:

	Urban	Rural
One grocery store	26%	46%
Two grocery stores	31%	34%
Three grocery stores	33%	15%
Four or more grocery stores	10%	5%

All the grocery stores named by urban families were in Natchez, while 52 percent named by rural families were in Natchez.

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[4] Table 2 in Appendix gives dollar volume of taxable retail sales.

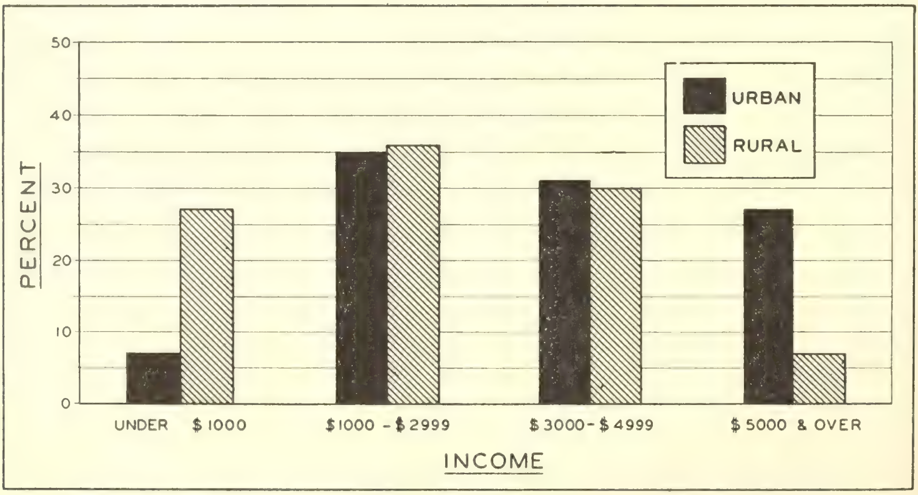

Figure 3. Distribution of urban and rural families by net income, 1953-54.

Homemakers were questioned about years they had traded with these groceries, and store loyalty seemed about the same in urban as in rural areas. About one-sixth of the stores named by urban and rural homemakers were reported as having been traded with for one year or less. Twenty-five percent named by urban homemakers and 31 by rural homemakers had been traded with more than 5 years.

Although rural families included in

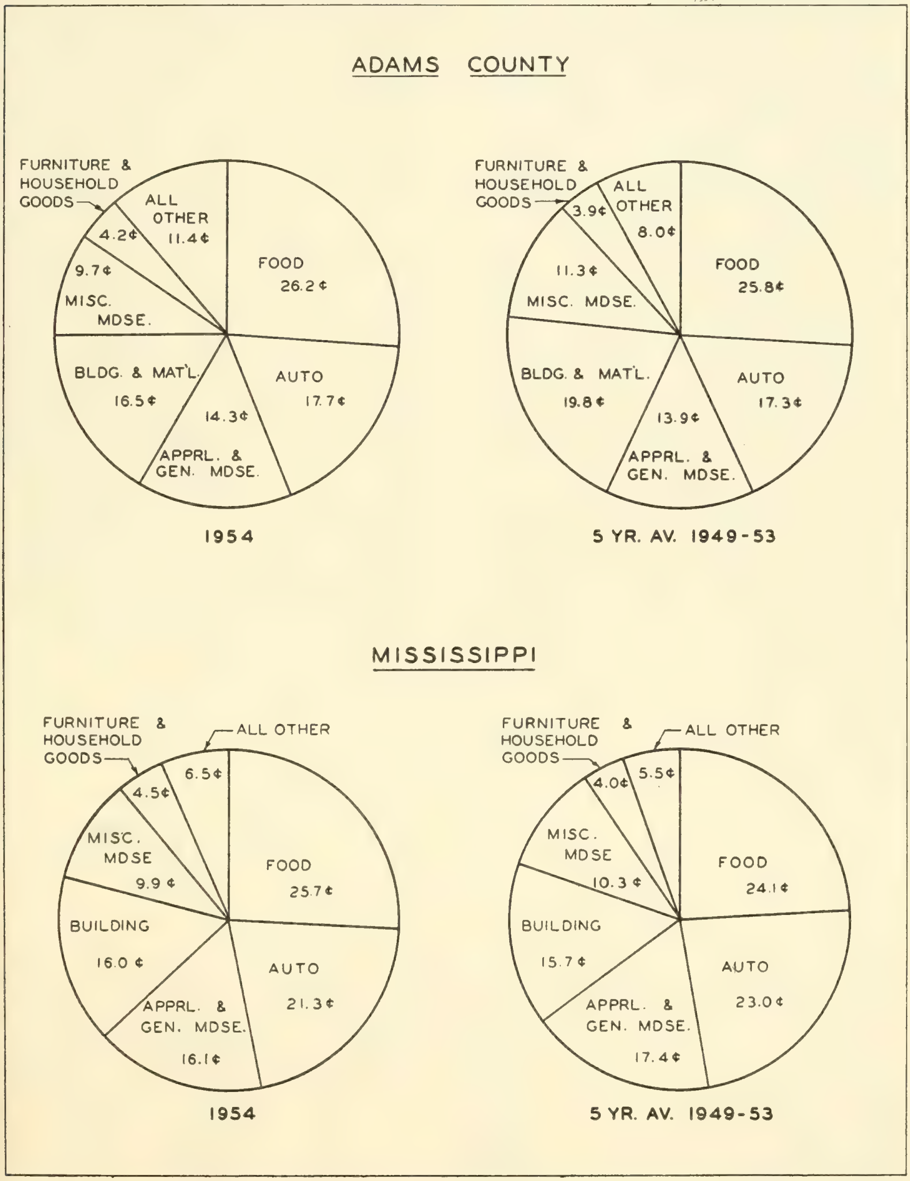

Figure 4. Division of the retail dollar by classes of consumers goods, Adams County and Mississippi.

this survey lived within a 10-mile radius of Natchez, there were 3 families who lived as far as 19 miles by way of the road to the city. About 30 percent lived from 10½ to 19 miles from Natchez by road distances.

About one-third of the rural families (32 percent) did not mention a Natchez grocery store when asked to report grocery stores where they traded. Three of the 41 families not mentioning a Natchez store lived as close as 3 miles from the city, but the majority not mentioning Natchez stores were 8 or more miles away. Only one-fourth of the 28 families in Concordia Parish, Louisiana, mentioned a Natchez grocery. There were three sample areas taken in Louisiana, all of them in the open country. The bridge connecting Natchez and Vidalia was opened for traffic in 1940, that is with time to develop new trade habits. But most of the Louisiana sample were farm tenants.

The wife (or female head) was the person who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. There was little difference in the percentage of men in rural and urban families who shopped for food or assisted in this activity.

Buying from local producers: The amounts of specified food products purchased from local producers by urban and rural families during one year (1953-54) are shown in Table 1. These are estimates made from purchases by urban and rural families in the survey blown up to represent the entire county. Also the percentage of families buying each product this way is shown. Eggs was the product which more families bought direct from producers (See Table 1.) A number also had bought vegetables this way.

In "beef and veal" are included animals purchased at the livestock market for slaughtering and freezing. Laws in Natchez in no way restricted selling direct by farmers. According to the law these solicitors "must keep moving, except when actually making sales, or get permission from the Mayor and Board of Aldermen to maintain a booth upon a public way."

The fact that most consumers did not desire to buy direct from producers rather than laws regulating sales no doubt accounted for the small percentage of families buying this way.

One of the important reasons given by consumers for not buying direct from farmers was inconvenience. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled. For rural people inconvenience was a less important reason, however. "Produce own, don't need" was a reply given by many homemakers when questioned about buying direct from producers. Urban homemakers, when questioned about practices of buying from producers often made comments such as: "This kind of milk is not healthy"; "I want chickens dressed and cut up"; "This kind of beef is not healthy"; "They don't give credit."

Other shopping habits: The amounts of purchased foods used during the report week and the amount bought at the last purchase were about the same for most foods except for whole milk, buttermilk, and certain meats.

Table 1. Estimated total amounts of specified food products bought from local producers during 1953-54 by urban and rural families in Adams County, and percentage of urban and rural families buying this way.

Food product	Urban families		Rural families	
	Quantity bought	Percent buying	Quantity bought	Percent buying
Whole milk	0	0	12,915 qts.	2
Eggs	136,450 doz	43	8,400 doz.	11
Broilers	5,100 no.	2	2,291 no.	2
Tomatoes	28,000 lbs	23	7,769 lbs.	9
Sweet potatoes	57,300 lbs.	17	10,109 lbs.	7
Leafy vegetables	46,750 lbs.	31	2,971 lbs.	7
Beef and veal	21,000 lbs	1	8,881 lbs.	2
Pork	0	0	0	0

Urban families bought an average of 1 8 quarts of whole milk at the last purchase and used an average of 8.7 quarts purchased whole milk during the report week. Rural families bought an average of 2.4 quarts of whole milk at the last purchase and used an average of 10.7 quarts of purchased whole milk during the report week. This means that whole milk was purchased from 4 to 5 times a week. Buttermilk was purchased from 2 to 3 times; an average of 3.2 quarts was used by both urban and rural families and an average of 1.4 quarts purchased at last time purchased.

Last purchases of broilers, of ham, and of beef hamburger were larger than amounts used due to the fact that a few families had freezer lockers or the use of community lockers.

The percentage of families whose last purchases[5] of certain foods was made at a retail grocery store in Natchez are shown below:

Purchased food	Urban	Rural
Mustard greens	79%	50%
Turnip greens	90%	80%
Cabbage	100%	59%
Tomatoes	81%	58%
Whole milk	81%	40%
Buttermilk	96%	43%
Broilers	99%	75%
Ham	86%	88%
Sausage	100%	63%
Pork chops	100%	62%
Fat back	100%	44%
Bacon	100%	65%
Beef hamburger	98%	68%
Beef roast	100%	100%
Beef steak	96%	61%
Eggs	75%	56%

Most of the foods not purchased in Natchez groceries were purchased from groceries in surrounding rural areas such as in Washington and in Vidalia. Tomatoes were bought by a number of families from local producers. Much of the milk not purchased from groceries was purchased from a milk plant (or creamery). Ten percent of the last purchases of whole milk by rural families and 19 percent by urban families were made this way. Twenty-three percent of the last purchases of eggs by urban families and 21 percent by rural families were made from local producers. The survey was made in June when local eggs are not as plentiful as in the spring.

When last purchases of specified foods were classified by whether for cash or credit, it was found that nearly one-fourth of these purchases was for credit. Urban and rural families did not differ much in this respect, but slightly more rural families used credit.

When one thinks of local food products for sale, one must remember that many consumer-buyers like processed foods as well as (or oftentimes better than) fresh foods; in other words, they like a change. Fresh turnip greens, therefore, compete with canned and frozen greens as well as with other green vegetables such as string beans, green limas and green peas. Whole milk competes with other milk products. Taking more of one type of product usually leads to taking less of another.

Table 2 shows spending patterns during one week for specified foods versus competing foods by Adams County families, based on purchases of urban and rural families in the survey, June 1954.

As brought out in the beginning of the report, Adams County had remarkably little seasonal difference in manufacturing employment during the year. (Figure 1). This would mean no difference in food expenditures due to slack or full employment at the particular time of the study.

Sources of the Family's Food

Many of the rural families in this survey carried on considerable home-production of food, but practically no urban family did. Four of the 125 urban families were farm operators. A few non-farm urban families kept chickens. Some families had a small garden. There were no ordinances in Natchez concerning cows or poultry other than restrictions concerning running at large and getting on property of others. The zoning ordinance allowed "customary agricultural operation."

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[5] Includes only families using during the report week specified foods obtained by purchase.

Thirty-seven percent of the rural and 2 percent of the urban families had used some home-produced milk during the year preceding the interview. One-fifth (19 percent) of the urban families reported some home-produced eggs. One-tenth reported some home-produced broilers used during this period. The percentage of rural families so reporting were 64 and 49 respectively. About one-fourth (29 percent) of the rural families had used home-produced pork and one-twentieth home-produced beef and veal. Only one urban family had used home-produced pork; only one home-produced beef.[6]

About two-thirds of the rural families and one-seventh of the urban families had used home-produced vegetables during the year preceding the interview. Mustard greens was the leafy vegetable most often grown for home use, but turnip greens was almost as important. Other leafy vegetables grown by many were cabbage and collards.

Fewer families grew tomatoes than grew leafy vegetables (about 44 percent rural and 11 percent urban). About as many rural families reported having sweet potatoes as reported tomatoes, but only 4 percent of the urban families said they had used some home-produced sweet potatoes during the report year.

From a study of the home-produced food supplies of the urban and rural families included in this survey, it seems that all urban families and most of the rural families (55 to 60 percent) depend largely on purchase for their food supply. Many families produced some products but only in small quantities. Many of these low producers have the philosophy of "live at home" and think little about the use of certain foods unless home-produced. When asked why they did not use some turnip greens, some eggs, some milk during the past week they replied, "Turnip greens in garden burnt up"; "Hens not laying"; "Cows dry".

In 20 (16 percent) of the urban families and 24 (19 percent) of the rural families surveyed, the family head had shifted from farm to non-farm work. An analysis of changes in home-production of these families should serve as a basis for prediction of what will happen as industrialization proceeds. Table

Table 2. Estimated total amount paid for purchased specified foods and purchased competing foods used during one week, June 1954, by urban and rural families in Adams County.

Kind of food	Urban families	Rural families	Total
Whole milk	$12,510	$2,528	$15,038
Buttermilk	1,517	242	1,759
Other dairy foods, such as dry and canned milk, cream, cheese, ice cream (does not include butter)	8,494	2,383	10,877
Fresh tomatoes	2,228	314	2,542
All other types of tomatoes, such as canned tomatoes, canned tomato juice, tomato paste, tomato soup, tomato catsup and tomato puree	2,793	877	3,670
Green, leafy vegetables	1,876	139	2,015
Green leafy vegetables processed	80	5	85
All other green and yellow vegetables, fresh and processed	5,108	526	5,634
Sweet potatoes cured	74	27	101
Sweet potatoes canned	50	16	66
Irish potatoes cured	1,322	265	1,587
Eggs	5,410	756	6,166
Broilers	8,584	1,387	9,971
Pork—fresh, cured and salted	12,019	3,700	15,719
Beef, veal—fresh	15,034	3,357	18,391
All other meats, including fish and other poultry, lunch meats, wieners, canned meats of pork, beef	6,728	2,223	8,951

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[6] Home-produced refers to products raised by the family on land on which the family home may or may not be located. Urban families having poultry and livestock were usually on the edge of the city or had farms outside the city limits.

3 shows changes in production for home use by urban and rural families accompanying these shifts in occupation. The urban family who had shifted from farm to non-farm work produced for home use just about like the family who had been in non-farm work all along; that is, very little.

On the other hand, those in rural areas who had shifted from farm to non-farm work produced slightly less than farm families not having made such a shift. When these changes are considered together the effect is to emphasize the shift from home-produced food to over-the-counter purchase of food as non-farm employment increases relative to farm employment.

Figure 5 shows the percentage of families using specified foods during the report week in June and the percentage who reported home-production as the source of these foods. Percentages using specified home-raised foods the past week are lower than percentages having used some of these during the previous year since many families have these foods only at the peak production season. The pork, broiler, and tomato percentages are, for example, considerably lower than the percentage of families having used some the previous year due to the fact that hogs killed in the Fall had in many cases been eaten. Broilers were not "ready" on many farms; tomatoes had not ripened.

In rural areas such as this the home-produced food is not the biggest competitor of that food in the market. The consumer who does not use certain products affords a bigger challenge (Figure 5). This non-use is brought about by such things as habit and other offerings in the market. (See Table 2).

Consumption Patterns

Table 4 shows total amounts of specified purchased foods used during one week by urban and rural families in Adams County, based on purchases of urban and rural families in the survey, June, 1954.

As has been previously explained, consumption data were also obtained from some of these same families by questionnaire for one week in Septem-

Table 3. Changes in production for home use accompanying shifts from farm to non-farm employment by family heads (in 16 percent of the urban and 19 percent of the rural families surveyed).

Food item	Urban families				Rural families			
	Ceased home prod.	Still prod.	Never prod.	Total	Ceased home prod.	Still prod.	Never prod.	Total
	%	%	%	%	%	%	%	%
Beef	15	0	85	100	17	5	78	100
Pork	90	0	10	100	62	25	13	100
Broilers	60	15	15	100	45	46	9	100
Eggs	70	20	10	100	42	54	4	100
Milk	65	0	35	100	33	38	29	100
Tomatoes	65	15	20	100	37	43	20	100
Turnip greens	60	30	10	100	21	50	29	100
Sweet potatoes	80	0	20	100	63	33	4	100
Cabbage	80	10	10	100	33	58	9	100

Table 4. Estimated total amount of specified purchased foods used during one week by all urban and rural families, Adams County, June 1954.

Food	Urban families	Rural families	Total
Whole milk	49,250 qts.	10,616 qts.	59,866 qts.
Buttermilk	8,838 qts.	1,228 qts.	10,066 qts.
Eggs	10,607 doz.	1,484 doz.	12,091 doz.
Broilers	17,425 lbs.	2,922 lbs.	20,347 lbs.
Pork (no lard)	17,860 lbs.	6,215 lbs.	24,075 lbs.
Beef, veal	25,750 lbs.	6,386 lbs.	32,136 lbs.
Fresh tomatoes	13,888 lbs.	2,266 lbs.	16,154 lbs.
Sweet potatoes	450 lbs.	199 lbs.	649 lbs.
Collards	100 lbs.	0 lbs.	100 lbs.
Turnip greens	865 lbs.	100 lbs.	965 lbs.
Cabbage	5,065 lbs.	1,544 lbs.	6,609 lbs.
Mustard	5,355 lbs.	357 lbs.	5,712 lbs.

ber 1954. There was a significant difference in the proportion of families using purchased sweet potatoes, cabbage, mustard greens, turnip greens, sausage, pork chops, beef roast, hamburger, in June and September. The percentage of both urban and rural families using these foods was greater in September than June.

Average amounts used by families using in the two periods were not very different except for sweet potatoes, sausage and pork chops which were used in larger amounts in September. Differences in the use of other foods in the two seasons were not significant.

Food consumption and income level: Tables 3, 4, and 5 in the Appendix show the proportion of families using specified foods from all sources and from purchase as well as the average amounts used from all sources and

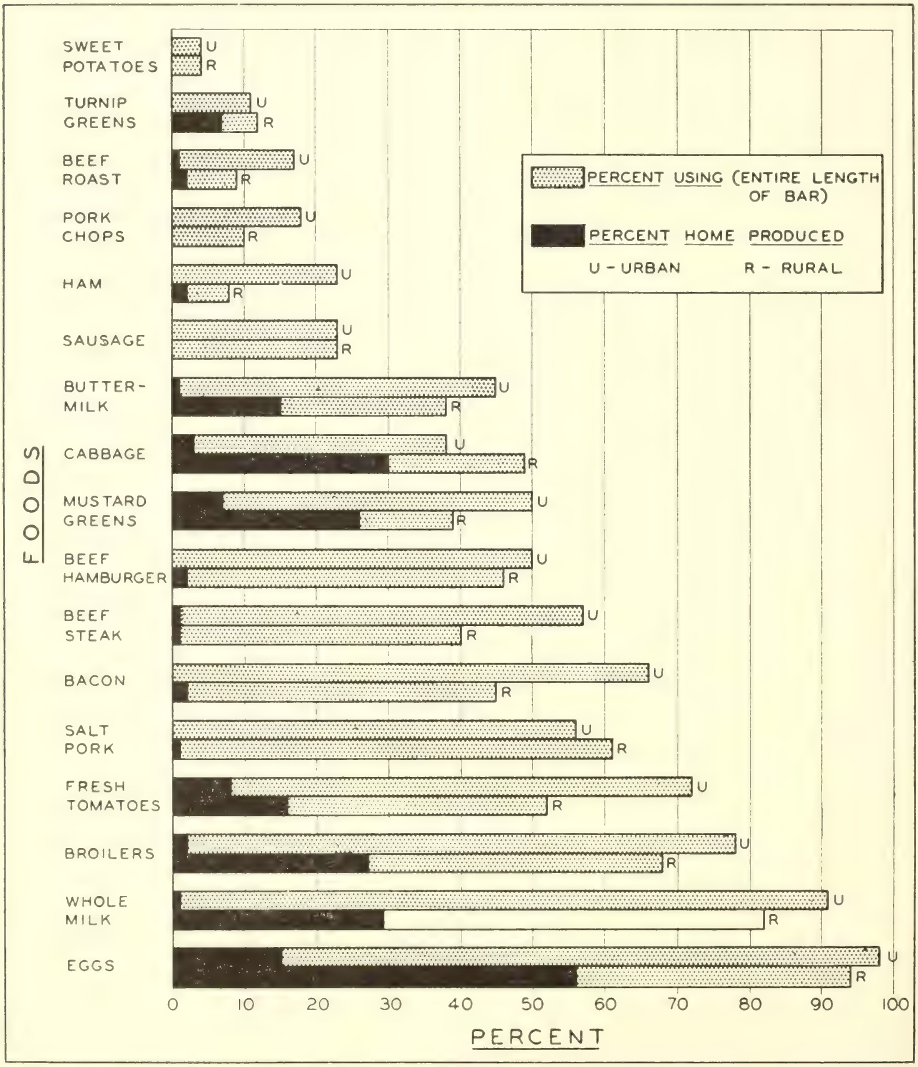

Figure 5. Percentage of rural and urban families using and producing at home specified foods during the report week, June 1954.

from purchase by families who used them. The changes in proportions using from lower to higher income are much greater in case of percentage buying than in percentage using. Some low income families produce these foods for home use; a few such families have these foods given to them by relatives.

Larger proportions of families in higher income groups purchased animal products (eggs, beef, bacon, ham, broilers) and tomatoes than of families in lower income groups. The percentages of urban families purchasing mustard and turnip greens, sausage and salt pork tended to decrease as income became greater. Similar decreases were found in purchases of salt pork by rural families. Average amounts of these foods used did not vary greatly in different income groups. The greatest variation was in whole milk, fresh tomatoes and cabbage. The first two were used in larger average amounts by higher income families and cabbage in larger amounts by lower income families (Tables 4 and 5 in the Appendix).

Since non-users of these foods are important to the markets it would be well to summarize briefly the most prevalent comments of urban and rural homemakers regarding non-use of these foods during the report week. Such a summary is included in Table 6 in the Appendix. As will be noted the principal reasons given by homemakers for non-use during the week were: (1) Financial—homemaker thought food was too expensive; she couldn't afford it or she had no money. (2) Use of similar or other types of foods instead. (3) Dependence on home supply—not accustomed to purchase. (4) Food not in season or considered an inappropriate food for this time of year. (5) Family doesn't care for the food.

Information concerning the use made of whole milk, buttermilk, tomatoes, and eggs by the family was determined from each interviewee. The use made of a food product determines to a large extent the type of product which the consumer-buyer will want. About 85 percent of the whole milk used by urban and rural families was used as a beverage or infant feeding. About 60 percent of the buttermilk was so used. Milk for drinking needs to be especially good tasting, fresh, and cold, if it is to satisfy the consumer-buyer and maintain her continued use in large quantities.

Practically all tomatoes used during the report week, June 1954 (98 percent by urban families and 96 percent by rural families) were used freshly sliced, or in salads or sandwiches. This use calls for a firm ripe tomato.

To be noted is the fact that about three-fourths of the eggs used by both urban and rural families were used in egg dishes, such as fried eggs, scrambled eggs, poached eggs and the like. Those not used in an egg dish were for the most part used in preparation of breads and cakes. An egg dish calls for an egg of higher quality than if used in bread, cake or the like. Off flavors may not be detected if in cornbread or a chocolate cake, but this is not the case with fried or scrambled eggs.

Use of milk products: Records of milk products consumed at home by members of the 253 families were obtained. Milk used by each family includes not only the fluid milk but the fluid milk equivalent of evaporated, condensed, and dry milk, cream, ice cream and cheese. Conversion factors developed by the Human Nutrition Branch of the U. S. Department of Agriculture to express the nutritive value of each product as compared with fluid whole milk were used in converting milk products into equivalent quarts of fluid milk. (The factors apply only in equating the various milk products to fluid whole milk on the basis of protein and mineral content). Quantities of milk or its equivalent recommended for different family members in the revised low-cost food plan developed by the U. S. Department of Agriculture home economists were used in estimating milk needs for the family.

Less than half the urban and rural families had the recommended amounts of milk products for families of their size and composition.[7] It is to be noted (Figure 6) that one in every fifth urban family and one in every third rural family had one-half or less than the suggested amounts of this important kind of food.

THE MARKET SURVEY

In 1954 there were approximately 181 retail food stores in Adams County (122 of which were in Natchez). Processing plants were limited to those of dairy products and meats. There were 2 milk bottling plants and distributors and 2 ice cream manufacturers. For meats there were 2 slaughter plants, one of which was also a poultry processor, and one frozen food locker plant that butchered hogs but did no slaughtering of beef.

Quantities and Sources of Selected Food Products Moving Through Natchez Food Stores

Large quantities of meats, eggs, milk and fresh vegetables are needed daily to supply consumer demand in food stores in a city of 23,000 people. What part of their supply of these products do Natchez food stores obtain from nearby producers? To find the answer to this and other marketing problems, a survey of the 122 food stores in Natchez was begun in the summer of 1954. From a randomly drawn one-third sample of these stores, data were obtained on quantities and sources of representative products purchased during June, 1954. In most instances data were transcribed directly from invoices or other purchase records of stores in the sample. For some items, where no itemized purchase records were available, store managers estimated monthly purchases. The survey was repeated for the months of October, 1954, and February, 1955, in order to obtain seasonal differences in quantities purchased and sources of supply. Data obtained from the sample stores for each of these three months were then used to derive estimates of the total quantities of the selected products moving through all retail food stores in Natchez during these months. These estimates are shown in Table 5.

Beef: Results of the survey indicate that 22 percent of the beef supply moving through Natchez retail stores in June was supplied by local processors. In October, a month when local slaughter is normally heavy, local suppies accounted for 45.6 percent of the total. In February, that part of the supply provided by local processors dropped below the October level, but still amounted to 30.6 percent of the total. Beef quantities shown in Table 5 include both carcass weights and wholesale cuts. There are numerous very small stores in Natchez that buy wholesale cuts only rather than carcasses or sides. Operators of many such stores stated that they preferred buying from local processors since they could get daily deliveries of small quantities and thereby avoid maintaining excessive inventories.

Since much of the beef moving through stores was not federally graded, no tabulation by quantities of each grade purchased could be made. While some stores purchased a high percentage of U. S. "choice" or "prime" grades, data indicate that the larger proportion of total beef purchased was equal in quality to commercial or lower grades. Many of the merchants, in comparing quality and handling costs of locally slaughtered and shipped-in beef, stated that beef supplied locally was equal in quality to that which they obtained from processors outside the area.

A national meat packer maintains a distribution warehouse in Natchez. Purchases from this firm, however, for the purposes of this study were considered as "shipped-in" rather than "local" since the firm performed no slaughtering and processing operations locally. An effort was made to include as "local" beef only that processed from local supplies of livestock. As mentioned earlier in this bulletin, Natchez is situated in an area of expanding beef cattle production. As numbers and incomes of consumers in the area increase, there should be an accompanying increase in the retail demand for beef. If local processors can maintain or increase their share of the wholesale market, this should mean an expanded market for beef animals produced in the area.

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[7] 90 percent of recommended amounts or more.

Pork: Local supplies accounted for only a small part of the total quantities of pork purchased by retailers in any of the survey months. As shown in Table 5 only 5.5 percent of the total supply came from local sources in June, 2.7 percent in October, and 6.0 percent in February. One local meat processor did not process pork during these months; another sold only fresh pork. Pork totals shown in the table include both fresh and cured pork. The inclusion, in the "shipped-in" totals, of such cured products as salt sides, bacon, and cooked hams thus tends to distort the relative importance of the two sources for strictly comparable products. No comparison was made on quantities of fresh pork alone supplied by each source. If such a comparison had been made percentages from local sources would have been greater.

The fact that such relatively small quantities of pork from local sources are marketed by Natchez retailers may partially explain the recent decline in pork production on farms in the area which was referred to in the beginning pages of this bulletin.

Broilers: Stores in the survey bought 22 percent of their June supply of dressed broilers from local processors. Corresponding percentages obtained from local sources in October and February were 14 and 30 percent, respectively. This does not necessarily imply, however, that all broilers so purchased were produced within the immediate area of Natchez. While certain sections of the state have become major broiler producing centers, relatively few broilers are produced in Adams or adjoining counties. Processors located outside major production areas often transport live birds long distances from such areas for processing in their plants. Thus, broilers bought from local processors and those purchased from "outside" suppliers

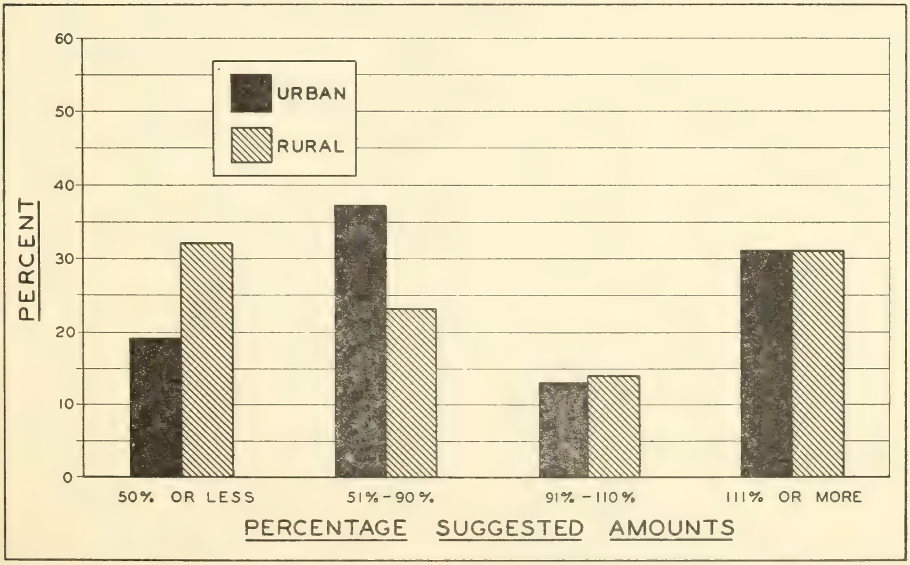

Figure 6. Percent of the 125 urban and the 128 rural families using amounts of milk products during report week, June 1954, suggested in low-cost food plans.

Table 5. Estimated quantities of selected food items moving through retail outlets in Natchez, Mississippi, for three months, by source of purchase.

Product	Unit	JUNE, 1954			OCTOBER, 1954			FEBRUARY, 1955		
		Shipped in	Local	Total	Shipped in	Local	Total	Shipped in	Local	Total
Beef	lb.	113,628	32,400	146,028	61,689	51,732	113,421	83,514	36,888	120,402
	%	77.8	22.2	100.0	54.4	45.6	100.0	69.4	30.6	100.0
Pork	lb.	99,330	5,790	105,120	97,905	2,676	100,581	85,506	5,427	90,933
	%	94.5	5.5	100.0	97.3	2.7	100.0	94.0	6.0	100.0
Broilers	lb.	66,186	18,402	84,588	81,645	13,638	95,283	43,872	18,936	62,808
	%	78.2	21.8	100.0	85.7	14.3	100.0	69.9	30.1	100.0
Eggs	doz.	13,902	13,692	27,594	25,185	14,697	39,882	14,127	11,514	25,641
	%	50.4	49.6	100.0	63.1	36.9	100.0	55.1	44.9	100.0
Milk	qt.	84,300	45,924	130,224	100,446	53,181	153,627	103,836	32,790	136,626
	%	64.7	35.3	100.0	65.4	34.6	100.0	76.0	24.0	100.0
Tomatoes	lb.	882	69,821	70,773	26,190	—	26,190	10,269	—	10,269
	%	1.2	98.8	100.0	100.0	—	100.0	100.0	—	100.0
Cabbage	lb.	13,575	3,780	17,355	21,300	—	21,300	18,300	—	18,300
	%	78.2	21.8	100.0	100.0	—	100.0	100.0	—	100.0

quite possibly may have been produced in the same area. Merchants buying from local processors listed the convenience of daily deliveries of freshly dressed birds as a major factor in choice of suppliers.

Eggs: Local egg supplies varied with the seasons. One-half of the total purchases in June were from local sources. In October only slightly more than one-third of the total came from these sources but by February, local suppliers were again providing nearly one-half of the total supply. Few instances of stores buying from producers in less than case lots were found. Many of the eggs classified in Table 5 as local were produced in nearby Franklin County and sold to retailers through a farmer cooperative. Poultry processors, both local and non-local, who supplied broilers also supplied eggs. The comments in the paragraph above relative to source of broilers may, therefore, apply equally well to eggs. For this reason it was difficult to obtain any clear-cut expressions of opinions on comparative qualities of eggs by sources, since the classification of sources was necessarily somewhat arbitrary.

Milk: Two local fluid milk processor-distributors provided roughly one-third of the total quantities of fluid milk moving through food stores in June and October, and about one-fourth of the total in February. Additional supplies were provided by a distributing plant in Jackson, Mississippi, one hundred miles distant. Data were not obtained on sources of supply of fluid milk to processor-distributors; so no estimate could be made of that part of the total supply which producers in immediate trade area furnished.

Tomatoes: In considering the relative importance of locally produced tomatoes to the total market supply, as shown by percentage figures for this product in Table 5, one must also consider the months covered by the data. Tomatoes were in season locally during only one of the survey months. In that month, June, stores surveyed reported buying essentially all of their supplies of tomatoes from local producers. Thirty-four of the 40 stores in the sample sold tomatoes in June. Of this number, only 9 stores reported obtaining any part of their June supply from other than local sources, while only two stores indicated complete dependence on shipped-in supplies that month. Locally grown tomatoes were not available in October and February.

Cabbage: Merchants estimated that more than one-fifth of the total poundage of cabbage sold in June was obtained from producers within the trade area. Cabbages bought from these producers were in the form of small, green heads, and were bought by the dozen, rather than by weight. The weight figure shown in Table 5 is therefore necessarily an estimate. No local cabbages were available in October or February.

Other products: Fresh greens and sweet potatoes were selected as other food products representative of those produced for the market by farmers in the area. It was anticipated that data would be obtained on quantities and sources of these commodities moving through food stores each month. Data obtained, however, were deemed too fragmentary to use as a basis for estimating total quantities for any of the three months. The survey revealed that many of the smaller food stores in Natchez did not sell fresh vegetables. The reason most often given for this was that volume of such sales did not justify the cost of maintaining refrigerated display counters. It was also found that, in most instances, retailers who bought vegetables from local growers recorded such purchases only as "produce purchased." Thus, while most were able to give data on expenditures for all produce, few felt they could estimate with any degree of reliability quantities of specific produce bought in any month. All stores reporting for June, however, stated that their entire supply of both greens and sweet potatoes for that month came from producers within the local area.

POSSIBILITIES FOR INCREASED BENEFITS FROM INDUSTRY TO LOCAL FARMERS

Rural families interviewed were asked about the sale of specified food products and difficulties in marketing. Very few had during the previous year sold or tried to sell any of the foods. Some of them mentioned eggs and a few mentioned sweet potatoes, pork, mustard greens and cabbage. None of these families reported difficulty in disposing of the product. In fact, several said their customers would have bought more. Furthermore, merchants expressed satisfaction with the quality of local products. But offerings of local producers were too limited for them to count as a main source for supply.

The market survey indicates that much of the existing demand for some of these products is being met with supplies brought in from outside the trade area. Thus it is not logical to assume that all the increase in demand expected from further industrialization of this rapidly growing trade area can or will be reflected to local producers. Greater marketing potentials, however, should afford opportunities for increased returns to those farmers who continue to produce food for the local market.

Possibilities for expanded beef cattle marketing to supply increasing demands for locally processed beef have already been mentioned. In view of the pattern of agricultural resources found on farms in the area, this field appears to possess opportunities for increased returns to a greater number of farmers than does the production of other food products. Close examination of income opportunities to be afforded from commercial laying flocks is warranted by the expected increase in demand for locally produced eggs.

The need for a larger and more varied local supply of fresh vegetables was expressed by several of the retailers interviewed. Few farmers in the area have resources suitable for the efficient commercial production of vegetables. The limited number having such resources, however, may increase their returns by planning their production to more nearly meet the needs of market operators.

SUMMARY

Data for this report were obtained in June, 1954 from a survey of 125 families in Natchez and 128 families in rural areas within a 10-mile radius of the city (including a sample of Concordia Parish, Louisiana families), and from a one-third sample of the food stores in Natchez where the majority of families traded, at least in part.

Income per capita for Adams County families, based on incomes of urban and rural families in the survey during 1953-54, was $1004.

Average per capita food expenditures for Adams County based on expenditures of families in the survey was $246.

When asked to name groceries where they traded, about one-third of the rural families did not mention a Natchez grocery. Those not mentioning a Natchez grocery were for the most part 8 or more miles away from this city.

The wife (or female head) was the one who shopped for food either with or without assistance of husband or others in the majority of rural as well as urban families. About the same percentage of men in rural and urban families shopped for food or assisted in this activity.

The majority of families included in the survey had bought none of the eight kinds of foods being studied (i.e., milk, beef, pork, broilers, eggs, sweet potatoes, tomatoes, and leafy vegetables) directly from producers during the year preceding the interview. Eggs and leafy vegetables were the foods most often purchased this way. Furthermore, there was no desire on the part of most consumers to buy from producers. Inconvenience was one of the important reasons given. Homemakers wanted to buy at certain times and to buy where there were all kinds of foods assembled.

A few families both urban and rural purchased beef, pork, broilers, from farmers to put in the home freezer or community locker. This practice may increase in the future provided consumers are satisfied with the quality of the meat bought.

Fifty percent or more of the last purchases of each of the specified foods (except whole milk, buttermilk and fat back) used by rural families were made at Natchez. The majority of last purchases of all food items listed were made at groceries in Natchez by urban families.

A comparison of amounts spent for specified foods and foods that competed with them showed large expenditures for competing products. Adams County families like a variety in kinds and forms of food. Farmers need to study changes in kinds of foods sold at food stores in the county as a basis for planning farm production programs.

All urban families and most of the rural families (55 to 60 percent) depend largely on purchase for their food supply.

Those in rural areas who had shifted from farm to non-farm work produced slightly less for home consumption than farm families not having made such a shift. The urban family who had shifted from farm to non-farm work produced for home use just about like the family who had been in non-farm work all along; that is, practically none.

When consumption of specified foods during June is compared with similar data during September, greatest seasonal variation was found in three meats and four vegetables. All of these were used by a larger proportion of families in September.

Increases in the proportion of families purchasing from lower to higher income group were greatest for beef, ham, bacon, eggs, broilers and tomatoes.

Principal reasons given for non-use of the specified foods were: (1) financial; (2) use of similar or other types of foods instead; (3) dependence on the home supply; (4) food not in season (or considered not in season); (5) family doesn't care for food.

A larger proportion of each of the specified food items moving through retail outlets in Natchez in June, October and February were shipped in. The exceptions to this were in June. Then 49.6 percent of the eggs and 98.8 percent of the tomatoes handled were local.

APPENDIX

Table 1. Yearly average employment, payrolls, and average wage paid per worker in manufacturing and related industries, Adams County, Mississippi, 1950-54.

INDUSTRY GROUP	AVERAGE EMPLOYMENT				
	1950	1951	1952	1953	1954
Manufacturing:					
Food Products	191	208	211	210	198
Apparel	476	458	350	223	161
Lumber and Wood Products	974	1,009	936	919	775
Furniture	9	27	29	69	—
Pulp and Paperboard	1,275	1,760	1,808	1,934	1,987
Printing and Publishing	121	130	133	130	136
Tires and Tubes	874	792	785	806	751
Machinery	25	28	—	—	—
Electrical Equipment	—	62	1	—	—
All Manufacturing	3,945	4,474	4,253	4,291	4,008
Service Industries	3,216	2,843	2,900	3,031	2,900

INDUSTRY GROUP	TOTAL PAYROLLS				
	1950	1951	1952	1953	1954
Manufacturing:					
Food Products	$ 507,898	$ 564,699	$ 587,866	$ 608,798	$ 595,040
Apparel	801,589	762,214	650,159	423,130	318,788
Lumber and Wood Products	1,949,822	2,152,987	2,003,698	2,109,362	1,735,881
Furniture	18,993	65,767	59,620	110,694	—
Pulp and Paperboard	4,544,094	6,147,652	7,807,786	8,453,375	8,467,475
Printing and Publishing	337,391	330,659	368,740	387,393	413,570
Tires and Tubes	3,041,630	3,115,130	3,249,943	3,564,379	3,335,371
Machinery	79,864	107,667	—	—	—
Electrical Equipment	—	59,395	*	—	—
All Manufacturing	$11,281,281	$13,306,170	$14,729,384	$15,657,131	$14,866,125
Service Industries	6,715,444	6,388,787	6,732,785	7,459,980	7,203,581

INDUSTRY GROUP	AVERAGE WAGE PAID PER WORKER				
	1950	1951	1952	1953	1954
Manufacturing:					
Food Products	$2,659	$2,715	$2,786	$2,899	$3,005
Apparel	1,684	1,664	1,862	1,897	1,980
Lumber and Wood Products	2,002	2,134	2,141	2,295	2,240
Furniture	2,110	2,436	2,056	1,604	—
Pulp and Paperboard	3,564	3,493	4,318	4,371	4,261
Printing and Publishing	2,788	2,544	2,772	2,980	3,041
Tires and Tubes	3,480	3,933	4,140	4,422	4,441
Machinery	3,195	3,845	—	—	—
Electrical Equipment	—	958	*	—	—
All Manufacturing	$2,860	$2,974	$3,463	$3,649	$3,709
Service Industries	2,088	2,247	2,362	2,461	2,489

Source: Computed from Mississippi Employment Security Commission. Monthly Employment and Quarterly Wages of Workers Covered by the Mississippi Employment Security Law, By County, By Industry, for the Calendar Years 1950-54.

*Withheld to avoid disclosure of individual data.

Table 2. Volume of Taxable Retail Sales, By Industry Groups, Adams County, 1944-54.

Year	Total retail	Food	Automotive	Apparel and general merchandise	Furniture and fixtures	Building and material	Miscellaneous retail	All other**
				Dollars				
1954	45,846,746	12,031,242	8,095,952	6,576,924	1,909,598	7,554,034	4,462,528	5,216,468
1953	45,440,040	12,429,134	8,172,448	6,588,620	1,812,896	7,313,891	4,177,120	4,945,931
1952	45,972,086	11,627,229	7,390,234	6,390,967	1,764,839	9,521,464	4,976,688	4,300,665
1951	42,196,992	11,694,567	7,090,176	5,520,856	1,690,959	7,979,487	4,697,790	3,523,157
1950	38,383,638	9,396,824	7,164,633	5,502,978	1,479,694	7,813,471	5,375,284	1,650,754
1949	37,724,382	8,977,068	6,417,070	5,162,272	1,484,822	8,799,645	4,419,113	2,464,392
1948	33,542,096	8,880,818	5,883,980	5,040,168	1,194,718	7,674,289	2,758,789	2,109,334
1947	29,091,628	7,849,523	4,338,357	4,949,894	1,046,902	6,861,577	2,407,882	1,637,493
1946	25,607,206	6,653,138	2,894,898	4,568,456	955,107	6,682,750	3,427,168*	425,689
1945	18,374,169	4,879,367	1,539,830	3,758,662	479,084	5,265,929	2,286,495*	164,802
1944	15,178,394	4,127,534	1,300,681	3,431,537	433,162	3,698,532	1,967,376*	219,572

Source: Mississippi State Tax Commission Bulletins Nos. 29, 31, 33, 35, 37, 39, 41, 43, 45, 46, and 49.

*Includes miscellaneous service sales.

**Entries for 1944-46 represent natural resource sales only; later years include natural resource and miscellaneous service sales.

Table 3. Percentage of urban and rural families using specified foods from any of one or more sources (bought, home-produced, gifts) and from purchase only by income groups during report week, June 1954.

Foods	Percent who used any from one or more sources								Percent who bought only							
	Urban families				Rural families				Urban families				Rural families			
	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over	$1170 and under	$1171 to 2210	$2211 to 3810	$3811 and over
Cabbage	36	36	29	45	51	47	57	41	21	28	23	29	15	13	13	11
Mustard greens	79	72	49	33	49	37	50	15	57	40	34	25	5	7	10	11
Turnip greens	14	12	14	8	10	20	13	4	14	4	9	8	2	10	3	0
Beef roast	0	8	9	31	2	10	3	22	0	8	9	29	2	7	3	15
Hamburger	29	24	63	59	27	40	70	56	29	24	63	59	24	40	70	48
Beef steak	21	44	66	67	24	37	47	59	21	44	66	67	22	33	47	57
Bacon	21	40	83	80	20	37	53	81	21	40	83	80	20	33	53	78
Pork chops	14	20	34	8	10	13	0	19	14	20	34	8	10	14	0	19
Sausage	43	28	26	14	17	17	37	26	43	28	26	14	17	17	34	26
Ham	7	16	23	31	2	3	10	19	7	16	23	31	2	0	10	15
Salt pork	79	68	49	49	78	73	53	30	79	68	49	49	73	73	53	26
Broilers	57	72	86	82	46	73	77	85	50	68	86	80	10	40	53	73
Eggs	93	96	100	98	80	100	100	96	29	64	91	92	5	20	57	67
Whole milk	79	76	100	96	61	80	100	96	71	76	100	49	20	43	63	74
Buttermilk	36	48	49	43	32	30	50	41	29	44	49	43	5	20	23	30
Sweet potatoes	7	12	0	2	2	7	3	4	7	12	0	2	2	7	3	4
Fresh tomatoes	36	44	74	94	22	40	70	89	29	40	60	69	7	23	30	63
Total families	14	25	35	51	41	30	30	27	14	25	35	51	41	30	30	27

Table 4. Average amount specified purchased foods used by urban and rural families using during report week, June 1954, by income groups.

Food	Urban families				Rural families			
	$1170 & under	$1171-2210	$2211-3810	$3811 & over	$1170 & under	$1171-2210	$2211-3810	$3811 & over
Beef steak, lbs.	1.67	1.59	3.19	3.18	2.00	1.98	2.43	2.44
Beef roast, lbs.	0	3.50	4.17	3.37	3.00	2.75	3.00	3.25
Beef hamburger, lbs.	1.56	1.33	1.54	1.98	1.90	2.12	1.99	2.29
Broilers, lbs.	3.07	3.03	3.64	4.05	2.12	3.10	3.19	3.96
Sausage, lbs.	1.08	1.36	1.33	1.57	1.28	2.20	1.32	2.00
Ham, lbs.	1.00	1.47	3.12	2.41	6.00	0	1.67	3.75
Salt pork, lbs.	1.50	1.41	1.57	1.19	2.29	2.50	2.31	.96
Bacon, lbs.	.83	1.25	1.10	1.43	1.44	1.70	1.30	2.07
Pork chops, lbs.	1.50	1.40	1.35	2.12	1.75	1.38	0	1.70
Fresh tomatoes, lbs.	1.75	1.88	3.81	4.91	1.33	2.14	3.22	5.21
Sweet potatoes, lbs.	2.00	1.83	0	1.50	2.00	2.50	4.00	1.00
Cabbage, lbs.	4.67	3.00	3.00	2.82	6.67	6.75	4.00	3.33
Mustard, lbs.	2.58	2.33	2.37	2.66	1.66	3.16	1.61	2.33
Turnip greens, lbs.	1.50	2.00	1.08	2.25	1.00	1.33	1.00	0
Whole milk, qts.	2.70	5.16	7.80	11.98	5.00	5.31	10.50	16.55
Buttermilk, qts.	2.50	3.27	3.82	2.99	3.50	2.17	3.57	3.62
Eggs, doz.	1.75	1.45	1.89	2.58	1.00	1.83	1.87	2.48
No. families	14	25	35	51	41	30	30	27

Table 5. Average amount specified foods used (all sources) by urban and rural families using during report week, June 1954, by income groups.

Food	Urban families				Rural families			
	$1170 & under	$1171-2210	$2211-3810	$3811 & over	$1170 & under	$1171-2210	$2211-3810	$3811 & over
Cabbage, lbs.	4.60	4.11	3.00	3.36	7.81	5.78	7.00	4.64
Mustard greens, lb.	2.53	2.59	2.43	2.79	3.46	3.46	3.89	2.25
Turnip greens, lbs.	1.50	3.33	1.05	2.25	2.00	1.83	4.25	2.00
Beef roast, lbs.	0	3.50	4.17	3.37	3.00	3.17	3.00	3.92
Beef hamburger, lbs.	1.56	1.33	1.54	1.98	2.09	2.12	1.99	2.38
Beef steak, lbs.	1.67	1.59	3.19	3.18	2.50	2.16	2.43	2.44
Bacon, lbs.	.83	1.25	1.10	1.43	1.44	1.68	1.30	2.02
Pork chops, lbs.	1.50	1.40	1.35	2.12	1.75	1.38	0	1.70
Sausage, lbs.	1.08	1.36	1.33	1.57	1.28	2.20	1.32	2.00
Ham, lbs.	1.00	1.47	3.12	2.41	6.00	2.00	1.67	3.40
Salt pork, lbs.	1.50	1.41	1.57	1.19	2.24	2.50	2.31	.91
Broilers, lbs.	3.31	3.08	3.64	4.01	4.03	3.99	3.67	4.10
Eggs, doz.	1.83	2.78	1.85	2.55	.99	1.57	1.79	2.70
Whole milk, qts.	2.73	5.16	7.80	11.98	8.84	11.60	12.18	15.19
Buttermilk, qts.	2.60	3.17	3.82	2.99	5.15	3.89	4.33	3.82
Sweet potatoes, lbs.	2.00	1.83	0	1.50	2.00	2.50	4.00	1.00
Fresh tomatoes, lbs.	2.20	2.02	3.62	4.71	2.22	3.17	4.33	5.94
No. families	14	25	35	51	41	30	30	27

Table 6. Reasons most often given by homemakers for non-use of specified foods during report week, June 1954 (listed in order of importance).

Food	Urban	Rural
Whole milk	No money, costs too much Don't drink Don't like	No money, costs too much Like competing dairy products Don't drink Don't buy when cows are dry
Buttermilk	Don't use Don't like Use competing dairy products	Use competing dairy products Didn't churn; use whole milk No money; can't afford
Broilers	Used other meats No money, costs too much	Used other meat Depend on home supply; don't buy No money, costs too much
Eggs (few did not use)	No money; costs too much	Hens didn't lay No money; costs too much
Ham	No money; costs too much Not in season Not on my diet; not good for me	No money; costs too much Home supply used up Used other kinds of meat
Pork chops	Not in season No money; costs too much Not on my diet; not good for me	No money; costs too much Not in season Eat when kill hogs; don't buy
Bacon	No money; costs too much Used other kinds of meat Never use or buy	No money; costs too much Never use Used other kinds of meat
Sausage	Not in season Not on diet; not good for me No money; costs too much	Not in season No money; costs too much Home supply used up; don't buy
Fresh tomatoes	No money; costs too much Didn't see any good ones in market Waiting for home supply to ripen	My tomatoes not ripe; waiting for home supply No money; costs too much
Cabbage	Don't like much Had other things this week	Don't like much Depend on home supply; ours burnt up Not in season
Turnip greens	Used other kinds of vegetables Didn't see any good ones in market Not in season; don't like much	Use own supply and ours gone to seed Used other vegetables this week No money; can't afford
Beef steak	No money; costs too much Had other kinds of meat or cuts	No money; costs too much Had other kinds of meat or cuts
Beef roast	No money; costs too much Used other meats or cuts	No money; costs too much Used other meats or cuts
Beef hamburger	Used other meats or cuts No money; costs too much	Used other meats or cuts of meat No money, costs too much
Mustard greens	Had other kinds of vegetables Didn't see any in market	Depend on home supply; mustard gone to seed Used other vegetables; quality of mustard poor now
Sweet potatoes	Not in season Quality poor now	Not in season Depend on home supply; don't buy

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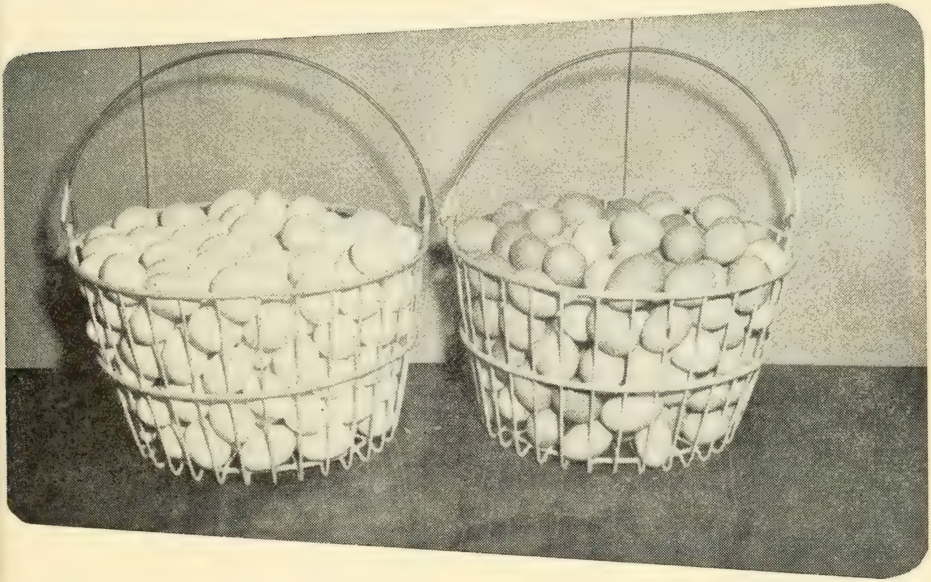
Investment, Costs and Returns To Egg Producers



By D. W. PARVIN

MISSISSIPPI STATE COLLEGE

AGRICULTURAL EXPERIMENT STATION

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STATE COLLEGE MISSISSIPPI

JUL 14 1956

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INVESTMENT, COSTS AND RETURNS TO EGG PRODUCERS

By D. W. PARVIN

The Problem: Commercial egg production has been increasing in importance in Mississippi for a number of years. Mississippi producers sold 516 million eggs in 1954 compared to 233 million in 1940.[1] Relatively high retail prices for eggs during recent years was the major factor accounting for the expansion of commercial egg production in Mississippi; also the surplus labor on small farms was a contributing factor in that a laying flock could be added to the farm operation without taking labor from other enterprises.

It is expected that consumers will have relatively large amounts of spendable income for some time; therefore the demand for eggs should continue at a high level. The total demand for eggs will increase as the population increases and as consumers become better informed about nutrition. Conditions in Mississippi are favorable for egg production because of the unused labor available on many small farms. The operators of most of these small farms do not have the land resources to produce livestock other than poultry. While capital is limited on most small farms, operating capital for egg production is easily obtained by producers able to provide buildings and equipment. Based upon the above observations, it is expected that the commercial production of eggs will continue to increase in Mississippi.

Producers not satisfied with present returns from their laying flocks and individuals contemplating producing eggs commercially for the first time need basic information on investment, cost, returns and management practices on which to base their decisions. This study was designed to provide this information.

Method of Study: Data for the study were obtained by personal interview with producers in Forrest, Stone, Perry, Lamar, Covington, Jones, and Jasper counties. This area was chosen because it is the oldest and largest concentration of laying flocks in the state.

The period covered in this study was from August 1, 1953, through July 31, 1954. This period was used because it starts and ends at about the time of the year when the majority of producers place pullets in laying houses.

Insofar as possible, a 100 percent sample of commercial egg producers in the sample area was taken. A producer with 200 or more laying hens was considered a commercial producer. Only those producers who started commercial egg production prior to August 1, 1953, were included in the study. A list of commercial egg producers in the sample counties was obtained from county agents, county cooperatives and feed dealers. Usable records were obtained from 54 producers and detailed information with regard to all phases of commercial egg production was obtained.

System of Farming

Type of Production: Forty of the 54 farms studied sold market eggs and 14 sold hatching eggs. None of the producers used cages for layers. Eight of the producers of hatching eggs sold market eggs part of the year. Eggs were produced and sold throughout the year by 33 operators. The 21 operators that did not produce throughout the year sold eggs an average of 9 months. In most cases the period out of production represented a more or less normal lag between the time the last of the old hens were sold and pullets were ready for the laying house. In some cases, the period out of production was due to the selling of flocks earlier than usual because of diseases.

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[1] Agricultural Statistics, United States Department of Agriculture, 1941 and The Poultry and Egg Situation, United States Department of Agriculture, May, 1955.

Type of Birds Used: All of the producers of market eggs used light breeds and all of the producers of hatching eggs used heavy breeds.

Size of Flocks: Producers of hatching eggs had larger flocks than those producing market eggs. For the production period, the number of hens per flock averaged 922 for flocks producing hatching eggs, 567 for those producing market eggs and 659 for all flocks. Twenty-five producers had less than 500 hens, 19 had from 500 to 999 hens, and 10 had more than 1,000 hens.

The number of layers housed was considerably larger than the average number on hand during the production period. The number of hens housed per flock averaged 1,205 for flocks producing hatching eggs, 797 for flocks producing market eggs and 903 for all flocks. For hatching flocks, 86 roosters were housed per flock and an average of 72 were kept during the production period.

Sources of Income: Approximately one-fourth of the producers received all of their farm income from the laying flock and two-thirds received 50 percent or more. For all farms, the sale of eggs accounted for an average of 59 percent of farm income; the remainder came from the following sources; beef cattle, 11 percent; milk, 9 percent; cotton, 7 percent; and miscellaneous enterprises, 14 percent.

Tenure and Color: For all practical purposes, all operators can be classified as white owner-operators. All of the operators were white and all owned their farms except two. These two lived on farms owned by a son or daughter.

Acres Operated: The average size farm producing commercial eggs was 102 acres, this was approximately one-half as large as the average for all farms operated by white owners in Mississippi.[2] Of the 54 farms, 13 had less than 50 acres, 36 had less than 100 acres and only 1 had over 300 acres.

Farm labor supply: Including the operator there was an average of 3.4 persons in the family labor force per farm (Appendix Table 1). There were approximately the same number of males and females and about 50 percent was between the ages of 18 and 60. Over half of the operators (52 percent) were over 50 years of age; 22 percent was over 60 years of age; and 24 percent was under 40 years of age (Appendix Table 2).

All of the daily chores connected with the production and marketing of eggs was done by the operator and members of his family. Only one producer hired labor to help with a seasonal job.

Experience of operators: Commercial production of eggs is a relatively new enterprise for most egg producers in Mississippi. Over one-half of the operators (52 percent) had produced eggs commercially for less than 5 years; less than one-fourth (22 percent) had produced them commercially 10 years or more (Appendix Table 3).

Resources Used and Management Practices

Laying houses: There were 106 laying houses on the 54 farms studied. Of this total, 45 had less than 1,000 square feet of floor space, 32 had from 1,000 to 2,000 square feet and 29 had more than 2,000 square feet of floor space. The amount of floor space per house averaged 1,577 square feet for flocks producing market eggs, 2,550 square feet for flocks producing hatching eggs and 1,852 square feet for all flocks. Floor space per 100 birds housed amounted to 386 square feet for flocks producing market eggs, 423 square feet for flocks producing hatching eggs and averaged 400 square feet for all flocks (Appendix Table 4). The recommended floor space per 100 birds housed is 300-350 square feet for light breeds and 350-400 square feet for heavy birds.

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[2] In 1950 the white-owner operated farms averaged 210 acres. United States Census of Agriculture, 1950.

Approximately three-fourths of the laying houses were between 20 and 32 feet in width. Twenty-seven percent were 30 feet wide; 17 percent, 24 feet; 16 percent, 20 feet; 8 percent, 32 feet; and 5 percent, from 26 to 29 feet wide. Thirteen percent were less than 20 feet wide and 14 percent were over 32 feet wide. Metal roofing was used on approximately three-fourths of the houses. Thirty-four percent of the houses had concrete foundations; 12 percent, concrete blocks; 10 percent, poles on concrete blocks; 29 percent, poles in the ground; and 15 percent miscellaneous types of foundations, mostly wood.

Equipment: All producers except one used trough hand-feeders; the other producer used mechanical feeders. Of the 53 producers using trough hand-feeders, 29 used wooden feeders, 16 used metal feeders and 8 used both wooden and metal feeders. The wooden troughs were built on the farm in all cases, except one, and the metal troughs were purchased in all cases, except two. Most of the trough hand-feeders (90 percent) were 4, 5, 6, 8, 10, or 12 feet long. On the 53 farms having trough hand-feeders, the amount of feeder space per 100 birds housed was equivalent to approximately 4 five-foot feeders or 2 ten-foot feeders.

Approximately two-thirds of the producers used automatic waterers. Thirty-one producers used automatic trough waterers only, 4 used automatic pan waterers only, 16 used hand waterers only, and 3 used a combination of hand waterers and automatic waterers. Practically all waterers were purchased.

Most of the automatic watering troughs were 3, 4, 5, 6, or 8 feet long with 4-foot waterers being the most common. On the 31 farms having automatic watering troughs, the amount of watering space per 100 birds housed was equivalent to one 5-foot waterer. Producers using other type waterers provided a comparable amount of watering space.

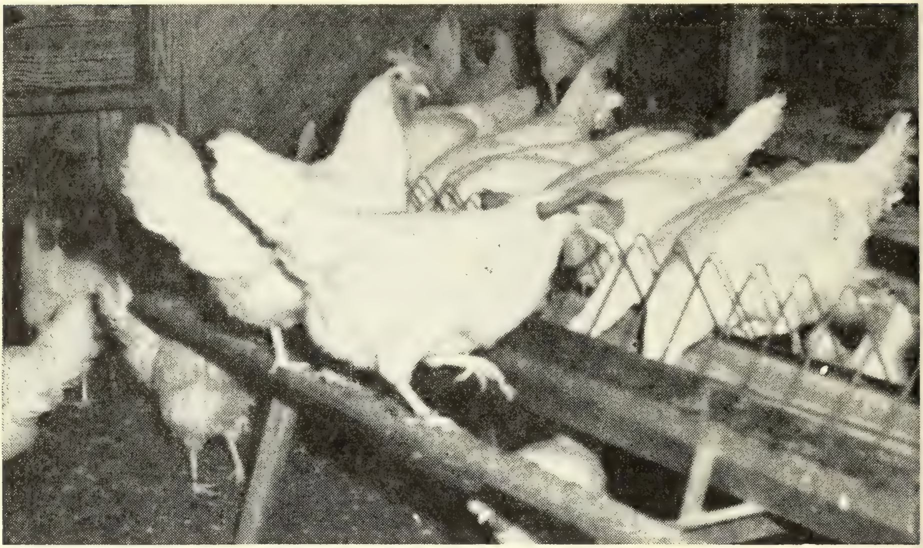
Eight of the 54 producers did not provide their hens with roosts. An average of eight linear inches of roosting space was provided per bird housed on the 46 farms having roosts.

Of the 54 producers, 29 used individual nests, 17 used community nests and 8 used both individual and community nests. When the community nests were converted to individual nest equivalent and added to the number of individual nest, it was found that 1 nest was provided for every 5 hens housed. Forty-one producers used wooden nests, nine used metal nests and three used both wooden and metal nests. The wooden nests were built on the farm in all cases, except three; all of the metal nests were purchased.

The amount of facilities provided by the average producer was equal to or greater than the recommended amount. The amount of feeding and watering space per 100 birds housed was considerably in excess of the amount commonly recommended. Roosting space, when provided, and nesting space was equal to or slightly in excess of the amount commonly recommended. The amount of all types of facilities, except roosts, provided per 100 birds housed was greater for hatching flocks than for market flocks.

Feeding Practices: Laying mash, grain, shell, and grit were the feeds used in egg production. Laying mash accounted for 69 percent of all feed used; grain, 26 percent; and osyter shell and grit, 5 percent (Appendix Table 5).

Four producers did not feed grain. Of the 50 producers feeding grain, 10 grew all of the grain fed, 14 grew part of the grain fed and 26 purchased all of the grain fed. All producers purchased and fed laying mash and oyster shell or grit.



Forty of the 54 flocks included in this study produced market eggs.

Feed used per 100 hens per day amounted to 282 pounds for flocks producing market eggs, 352 pounds for flocks producing hatching eggs and averaged 306 pounds for all flocks (Appendix Table 6). Feed used per dozen eggs produced averaged 6.45 pounds[3] for flocks producing market eggs, 7.51 pounds for flocks producing hatching eggs and 6.83 pounds for all flocks.

Labor Utilized: An average of 247 hours of labor was used per 100 hens during the year studied (Appendix Table 7). Of the total, 84 percent was devoted to daily chores, 9 percent to seasonal jobs and 7 percent to marketing. Producers of market eggs used 293 hours of labor per 100 hens compared to 172 hours for producers of hatching eggs. Larger flocks and more efficient equipment[4] were the major factors accounting for lower labor requirements per 100 hens for hatching flocks; also fewer days in production and less time spent in marketing contributed to the lower labor requirements for hatching flocks. Chore labor per day per 100 hens amounted to .71 hours for flocks producing market eggs, .46 hours for flocks producing hatching eggs and averaged .63 hours for all flocks.

The type of equipment used and the number of hens in the flock exerted considerable influence on labor required for daily chores. Chore labor per day per 100 layers averaged .60 hours for producers using automatic waterers and hand feeders compared to .94 hours for producers using hand waterers and hand feeders (Appendix Table 8). It should be recognized that all this difference is not attributable to difference in equipment because producers using automatic wat erers and hand feeders had larger flocks than producers using hand waterers and hand feeders.

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[3] This is higher than ordinarily expected for the production of market eggs; however, the producers of market eggs reported that they had more trouble with diseases than normal.

[4] Only one of the 14 producers of hatchin eggs used hand waterers, whereas, 15 of the 4 producers of market eggs used hand waterers. Also the producer using automatic feeders produced hatching eggs.

Since the majority of producers used hand feeders and automatic waterers, it was possible to calculate the relationship of the size of the laying flocks to the number of hours of chore labor required daily when this type of equipment was used. When hand-feeders and automatic waterers were used, the daily chore labor per 100 layers varied from .83 hours for flocks of 300 layers to .66 hours for flocks of 900 layers and .49 hours for flocks of 1,500 layers (Appendix Table 9).

Replacements: There were no significant differences in replacement practices for flocks producing hatching eggs and flocks producing market eggs. Practically all pullets (about 96 percent) were produced from sexed chicks. Age of pullets placed in laying houses varied from 4 to 7 months and averaged 5 months. Over half of the pullets, approximately 6 out of 10, were placed in laying houses in July and August. Pullets placed in laying houses cost an average of $1.78 each for flocks producing market eggs compared to $1.99 for flocks producing hatching eggs.[5]

Roosters Per 100 Hens: For flocks producing hatching eggs, an average of 8 roosters were kept per 100 hens during the period of time hatching eggs were being sold.

Health and Sanitation Practices: All producers of hatching eggs vaccinated their pullets for New Castles and foul-pox. Of the producers of market eggs, approximately 60 percent vaccinated for New Castles, 90 percent for foul-pox, and 12 percent for bronchitis. At regular intervals, 86 percent of the producers of hatching eggs and 68 percent of the producers of market eggs fed a worming mash.

At some time during the year, all producers cleaned and disinfected laying houses and equipment. The depth of litter varied from 3 to 15 inches and averaged 7 inches. The average depth of litter was approximately the same for both type producers. Forty-eight producers used shavings for litter and four producers used other materials such as oat straw, sawdust and pine needles; two producers of market eggs reported that no litter was used.

Mortality Rate: Mortality rate as used here refers to the number of hens that died during the production period expressed as a percentage of the average number of hens on hand during the production period. The mortality rate averaged 24 percent for flocks producing market eggs, 16 percent for flocks producing hatching eggs and 21 percent for all flocks (Appendix Table 10).

Production: Egg production includes eggs sold and eggs used by the farm family. Based upon the average number of hens, 177 eggs were produced per hen for the average production period of 330 days; this represents an egg production of 54 percent (Appendix Table 11). Egg production averaged 52 percent on farms producing market eggs and 56 percent on farms producing hatching eggs.[6]

Buying and Selling. In marketing eggs and hens, and buying poultry supplies, 30 producers bought and sold through farmer cooperatives, 10 bought through farmer cooperatives but sold to local merchants and 14 bought and sold exclusively through local merchants.

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[5] Estimated by producers. If produced under the same conditions, we would expect the difference in the cost of producing light breed pullets and heavy breed pullets to be greater than this. Evidently the producers of hatching eggs did a more efficient job of producing pullets than did the producers of market eggs; it will be shown later that they did a more efficient job of producing eggs than market egg producers.

[6] Ordinarily producers of market eggs have a higher percent egg production than producers of hatching eggs; however, during the year studied, the producers of market eggs had more trouble with diseases than producers of hatching eggs as evidenced by the higher mortality rate.

In practically all cases where producers bought and sold through farmer cooperatives, the cooperative delivered the supplies and picked up the eggs and hens. In those cases where producers did not buy and sell through farmer cooperatives, they had the expense of marketing their own eggs and hens, except in those cases where purchasers picked up eggs and hens at the farm.

Investment, Costs and Returns

Investment: Based upon 1954 prices, the replacement cost of laying houses, equipment and birds housed amounted to $461 per 100 hens housed (Table 1). Laying houses accounted for 47 percent of this total, equipment for 16 percent and birds housed for 37 percent. The replacement cost of the above items per 100 hens housed averaged $434 for flocks producing market eggs and $513 for flocks producing hatching eggs.

The average investment in laying houses and equipment over the lifetime of these items would be one-half of their replacement cost. Also the average investment in the laying flock for the year would be less than its replacement cost because the birds would depreciate in value during the year and the number would decline because of mortality and culling. For the year studied, the average investment per 100 hens[7] amounted to $329 for flocks producing market eggs, $370 for flocks producing hatching eggs and averaged $344 for all flocks (Appendix Table 12).

The replacement cost of laying houses averaged $217 per 100 hens housed. Replacement cost of houses as reported in this study included the cash cost of all material purchased and of all labor hired, plus the value of materials and labor furnished from the farm. Therefore, the cash cost of laying houses would be less than the replacement cost (total value) on farms where all or part of the labor and materials were furnished from the farm. The producers included in this study reported that cash costs represented 70 percent of the total value (replacement cost) of laying houses (Appendix Table 13).

The size of laying houses and the type of construction were the major factors influencing cost of construction per

Table 1. Replacement cost of houses, equipment, water systems and of birds used in egg production per 100 hens housed, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing Market eggs	Flocks producing Hatching eggs	All flocks
		Dollars	
Laying houses	213.17	225.23	217.27
Water system[1]	26.60	31.45	28.24
Feeders	10.16	24.07	14.95
Waterers	4.02	12.78	6.98
Roosts	7.40	4.31	6.31
Nests	13.93	19.34	15.73
Total houses and equipment	275.28	317.18	289.48
Laying flocks[2]	158.47	195.52	171.09
Total	433.75	512.70	460.57

[1] The flocks' share of the investment in the water system.

[2] Includes the value of roosters for hatching flocks. Hens carried over were valued at their depreciated value at the time pullets were housed.

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[7] Based upon the average number of hens during the production period.

Table 2. Cost of producing eggs, 54 producers, South Mississippi, August 1, 1953-July 1, 1954.

Item	Flocks producing market eggs		Flocks producing hatching eggs	
	Per 100 hens	Per dozen eggs	Per 100 hens	Per dozen eggs
	Dollars	Cents	Dollars	Cents
Feed	443.31	29.83	525.11	35.78
Flock	111.17	7.48	104.69	7.14
Miscellaneous	41.38	2.78	31.04	2.12
Total cash cost	595.86	40.09	660.84	45.04
Depreciation, buildings, and equipment	32.20	2.17	39.39	2.69
Interest on investment	16.44	1.11	18.52	1.26
Total non-cash cost	48.64	3.28	57.91	3.95
Total cost	644.50	43.37	718.75	48.99

square foot of floor space. Replacement cost of laying houses per square foot of floor amounted to 81 cents for houses having less than 1,000 square feet of floor space, 58 cents for houses having from 1,000 to 2,000 square feet of floor space, 45 cents for houses having over 2,000 square feet of floor space, and averaged 54 cents for all houses. The replacement cost of laying houses having an aluminum roof and a foundation of concrete or concrete blocks amounted to 60 cents per square foot of floor space compared to 49 cents for laying houses having a composition roof and a foundation of poles or posts (Appendix Table 14).

The replacement cost of equipment used in laying houses amounted to $44 per 100 hens housed. Of this total, $16 was invested in nests, $15 in feeders, $7 in waterers and $6 in roosts.

The replacement cost of the laying flock per 100 hens housed amounted to $158 for flocks producing market eggs and $196 for flocks producing hatching eggs. The replacement cost of the laying flock includes the cost of pullets when housed plus the depreciated value of hens carried over from the preceding production period. In addition, the cost of roosters is included in the replacement cost of the laying flock for producers of hatching eggs.

Costs. In this study, all work done in taking care of laying flocks was preformed by members of the farm family. For this reason a charge for labor is not included as a cost of producing eggs. Costs per 100 hens amounted to $644 for flocks producing market eggs and $719 for flocks producing hatching eggs; costs per dozen eggs averaged 43.4 cents for flocks producing market eggs and 49.0 cents for flocks producing hatching eggs (Table 2). Cash expenditures accounted for 92 percent of all costs for both type flocks. Cash expenses averaged $596 per 100 hens or 40.1 cents per dozen eggs for flocks producing market eggs compared to $661 per 100 hens or 45 cents per dozen eggs for flocks producing hatching eggs.

Feed was the most important item of cost accounting for 74 percent of cash cost for flocks producing market eggs, and 79 percent for flocks producing hatching eggs. Feed cost averaged $443 per 100 hens and 29.8 cents per dozen eggs for flocks producing market eggs; comparable figures for flocks producing hatching eggs were $525 per 100 hens and 35.9 cents per dozen eggs.

Flock cost was the second most important item of expense. Flock cost is the net cost to producers of using the laying flock during the period studied and was calculated as follows: the value of bird on hand August 1, 1953, plus the value of birds added to the flock during the year minus the value of birds sold, eaten and on hand July 31, 1954 (Appendix Table 15). Flock cost averaged $111 per 100 hens for flocks producing market eggs and $105 for flocks producing hatching eggs; flock cost per dozen eggs averaged 7.5 cents for market eggs and 7.1 cents for hatching eggs.

Miscellaneous cash expenditures which included cost of marketing, repairs on houses and equipment, medications and disinfectants, litter, electricity, insurance, and taxes amounted to $41 per 100 hens for flocks producing market eggs and $31 for flocks producing hatching eggs; these costs averaged 2.8 cents per dozen eggs for market eggs and 2.1 cents for hatching eggs. For flocks producing market eggs, miscellaneous cash costs per 100 hens averaged $16.86 for marketing, $9.02 for repairs on buildings and equipment, $6.98 for medications and disinfectants, $2.22 for litter, $3.15 for electricity, and $0.87 for taxes and insurance (Appendix Table 16). The cost of the above items per 100 hens were about the same for hatching flocks except that marketing costs were considerably lower and litter cost somewhat higher.

Non-cash cost items (depreciation on buildings and equipment and interest on investment) averaged $49 per 100 hens for flocks producing market eggs and $58 for flocks producing hatching eggs; these items of cost averaged 3.3 cents per dozen eggs for market eggs and 4.0 cents for hatching eggs. For flocks producing market eggs non-cash cost per 100 hens averaged $32 for depreciation and $16 for interest on investment; for flocks producing hatching eggs, these cost per 100 hens averaged $39 for depreciation and $19 for interest on investment.

Returns. The average total returns was $742 per 100 hens and 50 cents per dozen eggs for flocks producing market eggs compared to $1,049 per 100 hens and 71.5 cents per dozen eggs for flocks producing hatching eggs (Table 3). Egg sales accounted for 93 percent of total returns for producers of market eggs and 95 percent for producers of hatching eggs. Non-cash returns (value of eggs used on farm, value of sacks used on farms and the value of the manure) averaged $39 per 100 hens and 2.6 cents per dozen eggs for flocks producing market eggs; non-cash returns were about the same for producers of hatching eggs.

The difference between total returns and total costs as calculated in this study represents the return to the producer and his family for labor used in taking care of the enterprise and managing the enterprise. Returns to labor amounted to $98 per 100 hens, 6.6 cents per dozen eggs, and 34 cents per hour of labor for flocks producing market eggs; for flocks producing hatching eggs returns to labor averaged $330 per 100 hens, 22.5 cents per dozen eggs and $1.92 per hour of labor.

High-Profit Flocks

The most profitable flocks producing market eggs and the most profitable flocks producing hatching eggs were studied in order to determine the characteristics of each. Fifty percent of the flocks (20 market flocks and 7 hatching flocks) were included in the most profitable groups.

For flocks producing market eggs, the most profitable flocks had returns to labor of $277 per 100 hens compared to $98 for all flocks. For flocks producing hatching eggs, returns to labor per 100 hens averaged $475 for the most profitable flocks compared to $330 for all flocks (Table 4).

For flocks producing market eggs, it was found that the most profitable flocks had the following characteristics as compared to the average for all flocks: higher returns, lower costs, less capita in-

Table 3. Returns to egg producers, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing market eggs		Flocks producing hatching eggs	
	Per 100 hens	Per dozen eggs	Per 100 hens	Per dozen eggs
	Dollars	Cents	Dollars	Cents
Eggs sold	691.81	46.56	999.51	68.13
Sacks sold	11.46	.77	9.51	.65
Total cash receipts	703.27	47.33	1,009.02	68.78
Value of eggs used	14.92	1.00	8.73	.59
Value of sacks used	4.02	.27	3.68	.26
Value of manure[1]	20.21	1.36	27.08	1.84
Total non-cash returns	39.15	2.63	39.49	2.69
Total returns	742.42	49.96	1,048.51	71.47
Less total costs	644.50	43.37	713.75	48.99
Returns to labor	97.92	6.59	329.76	22.48
Returns to labor per hour of labor	.34		1.92	

[1] Producer's estimates of the value of manure saved. In Mississippi Experiment Station Bulletin Number 524 published in December 1954, it was reported that the value of manure produced, when taken from poultry houses, amounted to $7.34 per ton of feed fed. Based on the above report and the amount of feed fed. the value of manure produced amounted to $35 for flocks producing market eggs and $40 for flocks producing hatching eggs.. Therefore, it appears that egg producers handled the manure in such a way that part of the plant food was lost or else part of the manure was not saved.

vested per 100 hens, higher prices for eggs sold, more days in production, a higher rate of lay, less feed used per hen per day and per dozen eggs, more labor used per 100 hens per day and a lower mortality rate (Appendix Table 17).

For flocks producing hatching eggs, the differences between the most profitable flocks and the average for all flocks were found to be quite similiar to those found for flocks producing market eggs; however there were two exceptions. As compared to the average for all hatching flocks, the most profitable flocks had more capital invested per 100 hens and used slightly more feed per hen per day.

Returns Under Varying Price Conditions

In this study, feed accounted for 74 percent of the cash cost of producing market eggs and for 79 percent of the cash cost of producing hatching eggs. Therefore, from the standpoint of changing prices, the relationship between prices paid for feed and prices received for eggs would be the most important factor determining profits.

The relationship between egg prices and feed prices was about normal during the year studied. At that time the egg-feed ratio for Mississippi was 10.7, as compared to 10.6 for the 15-year period, 1940-1954 (Appendix Table 18). (The egg-feed ratio is the number of pounds of feed equivalent in value to one dozen eggs.)

During the 15-year period, 1940-1954, the most favorable egg-feed ratio for Mississippi was 11.8 in 1945 and the least favorable was 9.4 in 1952. If the egg-feed ratio had been at the 1945 level during the year studied, returns to labor per 100 hens would have been increased from $98 to $140 for the flock producing marketing eggs and from $330 to $379 for flocks producing hatching eggs (Appendix Table 19). On the other hand, if the egg-feed ratio had been at the 1952 level during the year studied, returns to labor per 100 hens would have been reduced to $37 for flocks producing market eggs and to $257 for flocks producing hatching eggs.

Returns to labor for the most profitable flocks were relatively high even when calculated on the basis of the least favorable egg-feed ratio reported during the past 15 years. When calculated on the basis of the least favorable egg-feed ratio reported from 1940 through 1954, returns to labor per 100 hens averaged $216 for the 20 most profitable market egg flocks and $392 for the 7 most profitable hatching egg flocks.

Table 4. Costs and returns per 100 hens on the most profitable farms, with comparisons, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing market eggs		Flocks producing hatching eggs	
	All flocks	20 most profitable flocks	All flocks	7 most profitable flocks
	Dollars	Dollars	Dollars	Dollars
Cost per 100 hens:				
Feed	443.31	445.72	525.11	592.73
Flock	111.17	84.21	104.69	117.34
Miscellaneous	41.38	36.20	31.04	33.04
Total cash cost	595.86	566.13	660.84	743.11
Depreciation	32.20	27.49	39.39	45.37
Interest on investment	16.44	16.04	18.52	20.61
Total non-cash cost	48.64	43.53	57.81	65.98
Total cost	644.50	609.66	718.75	809.09
Returns per 100 hens:				
Eggs sold	691.81	833.28	999.51	1,232.62
Sacks sold	11.46	10.52	9.51	9.96
Total cash receipts	703.27	843.80	1,009.02	1,242.58
Value of eggs used	14.92	19.12	8.73	7.86
Value of sacks used	4.02	5.32	3.68	3.29
Value of manure	20.21	18.83	27.08	30.35
Total non-cash receipts	39.15	43.27	39.49	41.50
Total returns	742.42	887.07	1,048.51	1,284.08
Total returns	742.42	887.07	1,048.51	1,284.08
Less total cost	644.50	609.66	718.75	809.09
Returns to labor	97.92	277.41	329.76	474.99

SUMMARY AND CONCLUSIONS

Investment Required: The replacement cost of laying houses, equipment and birds housed amounted to $461 per 100 birds housed. Of this total laying houses accounted for 47 percent; equipment, 16 percent; and birds housed, for 37 percent. The replacement cost of the above items per 100 hens housed averaged $434 for flocks producing market eggs and $513 for flocks producing hatching eggs.

Annual Costs: Costs per 100 hens amounted to $644 for flocks producing market eggs and $719 for flocks producing hatching eggs. This includes depreciation and interest on investments listed above. Cash expenditures accounted for 92 percent of total cost. Cash expenses averaged $596 per 100 hens for flocks producing market eggs compared to $661 per 100 hens for flocks producing hatching eggs. Feed was the most important item of cost accounting for approximately three-fourths of cash costs.

Annual Returns: Returns, of which egg sales accounted for about 94 percent, averaged $742 per 100 hens for flocks producing market eggs compared to $1,049 per 100 hens for flocks producing hatching eggs. Returns to labor amounted to $98 per 100 hens and 6.6 cents per dozen eggs for flocks producing market eggs; for flocks producing hatching eggs, returns to labor averaged $330 per 100 hens and 22.5 cents per dozen eggs.

Hatching vs. Market Eggs: Higher prices received for eggs, a higher rate of lay and a lower mortality rate were the major factors accounting for profits being higher for hatching egg flocks than for market egg flocks. The producers of hatching eggs used better health and sanitation practices and provided their hens with more adequate facilities than did the producer of market eggs; this probably accounts for hatching flocks having the higher rate of lay and the lower mortality rate.

Most Profitable Flocks: A comparison of the most profitable flocks with the average for all flocks of the same type showed that the managers of the most profitable flock did a better job in practically all phases of management. Returns to labor per 100 hens averaged $277 per year for the 20 most profitable flocks producing market eggs and $475 for the 7 most profitable flocks producing hatching eggs.

Price Relationship: In this study, feed accounted for approximately three-fourths of the cash cost of producing eggs. Therefore, from the standpoint of changing prices, the relationship between prices paid for feed and prices received for eggs would be the most important factors determing profits. The relationship between egg prices and feed prices was about normal during the year studied. If, during the year studied, the egg-feed ratio had been at the least favorable level that existed during the preceding 15 years, the average producer would have had a return to labor of $37 per year per 100 hens for market eggs and $257 for hatching eggs.

It appears that from the standpoint of price relationships, the egg laying enterprise in Mississippi is relatively safe in that the average producer could expect some return to labor most years.

Appendix Tables

Appendix Table 1. Age and sex of the family labor force, 54 egg producers, South Mississippi, August 1, 1953-July 31, 1954.

Age groups	Number per farm			Percent of Total
	Males	Females	Total	
Under 9	.28	.17	.47	13
9-12	.17	.17	.34	10
13-17	.20	.26	.46	13
18-59	.85	.87	1.72	51
60-69	.13	.13	.26	8
70 & over	.13	.04	.17	5
Total	1.76	1.64	3.40	100

Appendix Table 2. Age of operators, 54 egg producers, South Mississippi, August 1, 1953-July 31, 1954.

Age groups	Number of producers	Percent of producers
30-39	13	24
40-49	13	24
50-59	16	30
60-69	6	11
70-79	6	11
Total	54	100

Appendix Table 3. Years in commercial egg production, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Years in production	Number of producers	Percent of producers
25 and over	4	7
20-24	2	4
15-19	1	2
10-14	5	9
5-9	14	26
Under 5	28	52
Total	54	100

Appendix Table 4. Facilities used in egg production per 100 birds housed, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Unit	Flocks producing		All flocks	Recommended per 100 birds housed[1]
		Market eggs	Hatching eggs		
Laying houses	Square feet	386	423	400	300- 400
Feeders	Linear inches	415	547	466	300
Waterers	Linear inches	110[2]	127[2]	118[2]	48- 77
Roosts	Linear inches	864[3]	744[3]	816[3]	800-1,000
Nests	Number[4]	18[5]	25[5]	20[5]	17- 20

[1] J. E. Hill, Head of Poultry Department, Mississippi State College.

[2] For those having automatic trough waterers.

[4] Community nests were converted to the equivalent of individual nests by dividing the number of square feet in community nests by the average number of square feet in individual nests.

[5] Per 100 hens housed.

Appendix Table 5. Composition and cost of rations used in producing eggs, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Composition of ration			Cost per 100 pounds		
	Flocks producing			Flocks producing		
	Market eggs	Hatching eggs	All flocks	Market eggs	Hatching eggs	All flocks
Laying mash	70.8	66.0	68.9	5.09	5.30	5.18
Grain	23.3	29.2	25.7	4.09	4.15	4.12
Shell and grit	5.9	4.8	5.4	1.15	1.16	1.15
Total	100.0	100.0	100.0	4.63	4.77	4.68

Appendix Table 6. Total feed fed per 100 hens, feed per 100 hens per day and feed fed per dozen eggs produced, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing		
	Market eggs	Hatching eggs	All flocks
Total pounds fed per 100 hens	9,575	11,016	10,098
Total pounds fed per 100 hens per day	282	352	306
Total pounds fed per dozen eggs	6.45	7.51	6.83

Appendix Table 7. Hours of labor used per 100 hens, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing		
	Market eggs	Hatching eggs	All flocks
Daily chores[1]	243	145	208
Seasonal	23	24	23
Marketing	24	3	16
Total	290	172	247

[1] Chore labor per 100 hens per day amounted to .71 hours for flocks producing market eggs, .46 hours for flocks producing hatching eggs and averaged .63 hours for all flocks.

Appendix Table 8. Daily chore labor used per 100 hens related to type of equipment used, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Average No. of hens per flock	Daily chore labor	
		Per farm	Per 100 hens
Automatic waterers and hand feeders	782	4.73	.60
Hand waterers and hand feeders	293	2.76	.94
All producers	659	4.18	.63

Appendix Table 9. Relationship of size of flock to the daily chore labor required on farms using hand feeders and automatic waterers, South Mississippi, August 1, 1953-July 31, 1954.

Average number of hens	Daily chore labor (hours)	
	Per farm	Per 100 hens
300	2.49	.83
600	4.46	.74
900	5.92	.66
1,200	6.87	.57
1,500	7.30	.49

Source: Based upon the formula $Y = .0091426\ X - .0000028512\ X^2$, where X equals the average number of hens in the flock and Y equals the daily chore labor per flock. This formula was estimated by regression techniques from labor requirements reported by producers using automatic waterers and hand feeders. The b values are significant at the 1 percent level.

Appendix Table 10. Mortality rate, by type of production, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing		All flocks
	Market eggs	Hatching eggs	
Average number of hens per farm[1]	567	922	659
Number of hens dying per farm	137	144	139
Mortality rate, percent	24	16	21

[1] During the production period.

Appendix Table 11. Eggs produced by type of production, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Unit	Flock producing		All flocks
		Market eggs	Hatching eggs	
Eggs sold per farm	number	98,846	160,315	114,782
Eggs used per farm	number	2,175	2,066	2,147
Eggs produced per farm	number	101,021	162,381	116,929
Average number of hens[1]	number	567	922	659
Eggs produced per hen	number	178	176	177
Days in production[2]	number	340	313	330
Egg production	percent	52	56	54

[1] During the production period.

[2] Days in production weighted by the average number of hens.

Appendix Table 12. Investment per 100 hens[1], 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing		All flocks
	Market eggs	Hatching eggs	
		Dollars	
Laying houses	149.91	147.18	148.87
Water system	18.70	20.61	19.42
Feeders	7.05	15.73	10.32
Waterers	2.82	8.35	4.86
Roosts	5.29	2.82	4.25
Nests	9.70	12.58	10.77
Total houses and equipment	193.47	207.27	198.49
Laying flock	135.28	163.23	145.38
Total	328.75	370.50	343.87

[1] Based upon the average number of hens during the production period.

Appendix Table 13. **Relationshiip of size of laying houses to replacement cost, 106 houses, South Mississippi, August 1, 1953-July 31, 1954.**

Item	Size of houses in square feet			All flocks
	Under 1,000	1,000-2,000	Over 2,000	
Number of houses	45	34	27	106
Floor space per house, square feet	687	1,496	4,243	1,852
Replacement cost per house, dollars	554	867	1,908	999[1]
Replacement cost per square foot of floor space, cents	81	58	45	54

[1] Cash cost averaged $704 per laying house.

Appendix Table 14. **Relationship of type of construction to replacement cost, 48 houses, South Mississippi, August 1 ,1953-July 31, 1954.**

Type of construction	Number of houses	Replacement cost per house[1]	Replacement cost per square foot
		Dollars	Cents
Aluminum roof, concrete foundation	26	1,087	60
Aluminum roof, concrete block foundation	10	1,089	60
Composition roof, poles or post foundation	12	875	49

[1] For houses 30 feet by 60 feet (1,800 square feet). Estimated by regression techniques.

Appendix Table 15. **Flock cost per farm and per 100 hens, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.**

Item	Flocks producing	
	Market eggs	Hatching eggs
	Dollars	
Value of birds on hand, August 1	792	1,396
Plus value of birds added	846	2,383
Minus value of birds sold	411	1,122
Minus value of birds eaten	17	17
Minus value of birds on hand, July 31	580	1,674
Flock cost per farm	630	966
Flock cost per 100 hens	111	105

Appendix Table 16. **Miscellaneous cash expenditures for egg production per 100 hens, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.**

Item	Flocks producing	
	Market eggs	Hatching eggs
	Dollars	
Marketing costs	16.86	2.65
Repairs	9.02	9.68
Medications and disinfectants	6.98	6.80
Litter	2.22	6.09
Electricity	3.15	3.59
Insurance and taxes	.87	1.53
Other	2.28	.70
Total	41.38	31.04

Appendix Table 17. Comparison of various factors and practices for the most profitable flocks with the average for all flocks, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Flocks producing market eggs: All flocks	Flocks producing market eggs: Most profitable flock	Flocks producing hatching eggs: All flocks	Flocks producing hatching eggs: Most profitable flock
Number of farms	40	20	14	7
Average number of hens per farm	567	526	922	1,191
Average number of days in production	340	361	313	344
Average investment per 100 hens (dollars)	329	321	370	411
Price received per dozen eggs sold (cents)	48	49	69	72
Pounds of feed used:				
Per 100 hens per day	282	266	352	360
Per dozen eggs	6.45	5.47	7.51	7.18
Hours of labor used:				
Per 100 hens	290	290	172	182
Per 100 hens per day	.71	.80	.46	.53
Mortality rate:				
Number of hens dying per farm	137	76	144	197
Percent mortality	24.2	14.5	15.6	16.5
Rate of lay:				
Eggs produced per hen	178	211	176	207
Egg production, percent	52	58	56	60

Appendix Table 18. The egg-feed ratio for Mississippi for the year studied compared with the annual egg-feed ratio for Mississippi from 1940 through 1954.

Year	Poultry feed price per pound[1]	Eggs price per dozen[1]	Egg-feed price ratio[2]
1940	1.88[3]	19.4	10.3
1941	2.33[3]	23.6	10.1
1942	2.58[3]	28.8	11.2
1943	3.31[3]	36.5	11.0
1944	3.24[3]	35.2	10.9
1945	3.44	40.5	11.8
1946	4.09	43.8	10.7
1947	4.70	49.6	10.6
1948	4.87	50.1	10.3
1949	3.88	46.1	11.9
1950	4.07	40.3	9.9
1951	4.39	49.3	11.2
1952	4.81	45.1	9.4
1953	4.50	47.9	10.6
1954	4.32	41.4	9.6
Average:			
1940-1949	2.67	28.7	10.7
1945-1949	4.20	46.0	11.0
1950-1954	4.42	44.8	10.1
1940-1954	3.76	39.8	10.6
August, 1953-July, 1954	4.34	46.4	10.7

Source: Crops and Markets, Volume 31, 1955, Agricultural Marketing Service, United States Department of Agriculture; and monthly issues of Agricultural Prices, Agricultural Marketing Service, United States Department of Agriculture.

[1] Simple average of monthly prices.

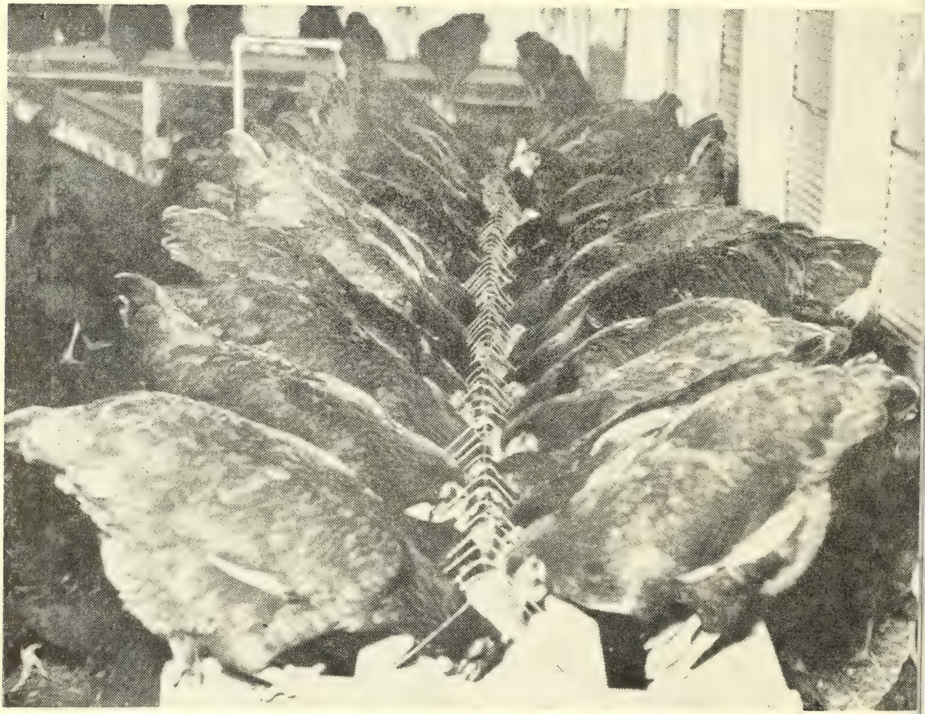
[2] Number of pounds of poultry feed equivalent in value to a dozen eggs.

[3] Estimated. Based upon the average prices reported for the United States and the average relationship between Mississippi prices and United States prices from 1945 through 1954.

Appendix Table 19. Cost and returns per 100 hens with varying egg-feed price ratios, 54 producers, South Mississippi, August 1, 1953-July 31, 1954.

Item	Egg-feed ratio	Total returns	Total cost	Return to labor
All flocks producing marketing eggs:				
Average for the year studied	10.7	742.42	644.50	97.92
Most favorable egg-feed ratio[1]	11.8	742.42	602.83	139.59
Least favorable egg-feed ratio[1]	9.4	742.42	705.68	36.74
All flocks producing hatching eggs:				
Average for the year studied	10.7	1,048.51	718.75	329.76
Most favorable egg-feed ratio[1]	11.8	1,048.51	669.39	379.12
Least favorable egg-feed ratio[1]	9.4	1,048.51	791.22	257.29
Twenty most profitable flocks producing market eggs:				
Average for the year studied	10.7	887.07	609.66	277.41
Most favorable egg-feed ratio[1]	11.8	887.07	567.76	319.31
Least favorable egg-feed ratio[1]	9.4	887.07	671.17	215.90
Seven most profitable flocks producing hatching eggs:				
Average for year studied	10.7	1,284.08	809.99	474.99
Most profitable egg-feed ratio[1]	11.8	1,284.08	754.27	529.81
Least profitable egg-feed ratio[1]	9.4	1,284.08	891.79	392.29

[1] These calculations show what returns to labor would have been during the year studied if the egg-feed ratio had been equal to the highest or lowest level reported during the 15-year period, 1940-1954. In these calculations returns and all costs except feed are those reported for the year studied; the cost of feed was adjusted to give the egg-feed ratio specified. Feed costs were decreased 9.4 percent to give the egg-feed ratio 11.8 and increased 13.8 percent to give the egg-feed ratio 9.4.



Fourteen of the 54 flocks included in this study produced hatching eggs.